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ERRATA

Volume xvii page 14 line 43 and xviii page 89 line 3 for '[*Vigna unguiculata*]' read '[*Cajanus cajan*]'

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page 18 line 1 after 'tests' insert 'on tulips'
20 44 for '*cyntherismae*' read '*syntherismae*'
42 35 for '$2' read '$2.50'
47 11 for '*kuhnii*' read '*kuehnii*'
47 15 for '*Philipp. J. agric.*' read '*Philipp. J. Sci.*'
63 4 for 'Yarwood (E. C.)' read 'Yarwood (C. E.)'
77 47 for '*Aonodiella*' read '*Aonidiella*'
126 33 for '450' read '453'
203 37 for '*rupricaprina*' read '*rupicaprina*'
233 24 for '*Haplographium*' read '*Haplophragmium*'
243 7 for 'grapefruit' read 'wild olive'
267 8 for 'Crouch' read 'Couch'
289 7 for 'xviii, p. 532' read 'xx, p. 202'
342 45 and 48 for '*Achyla*' read '*Achlya*'
344 18 for '*cyclopeum*' read '*cyclopium*'
351 22 for '327' read '324'
363 22 for '[*Cicer arietinum*]' read '[*Cajanus cajan*]'
366 48 for 'Sprague (R. A.)' read 'Sprague (R.)'
383 34 for '*homoeocarpi*' read '*homoeocarpa*'
452 45 for '131' read '130'
455 5 after 'Jenkins (Anna E.)' insert 'Ruehle (G. D.)'
471 18 for '*officinale*' read '*somniferum*'
542 31 for 'Blood (L. H.)' read 'Blood (H. L.)'

IMPERIAL MYCOLOGICAL INSTITUTE

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PADWICK (G. W.). **Report of the Imperial Mycologist.**—*Sci. Rep. agric. Res. Inst., New Delhi, 1939–40*, pp. 94–101, 1941.

The following are among the items of interest in this report [cf. *R.A.M.*, xix, p. 583]. Tests with wheat varieties for resistance to *Ustilago tritici* [loc. cit.] with a collection of the smut made at Delhi in 1939 suggested that this may be a different physiologic race from that represented by the Pusa collection used in earlier experiments. Of 70 wheat varieties tested against *Urocystis tritici* [loc. cit.], 29 showed no infection, including all those that remained unaffected in previous years.

A fungus closely resembling *Ophiobolus graminis* was isolated from a foot and root rot of wheat new to India found near Pusa. Inoculation tests showed the fungus to be very destructive and to produce symptoms identical with those of take-all. No perithecia were observed.

The *Fusarium* causing gram wilt [*F. orthoceras* var. *ciceri*: ibid., xx, p. 83] was shown to survive well in roots and stems, even apparently healthy ones growing among diseased gram harbouring enough to be parasitic on the next season's crop. Application of farmyard manure hastened the disappearance of the fungus. A species of *Trichoderma* highly antagonistic to the organism in Petri dishes was useless in the soil and an *Aspergillus* which retarded infection was subsequently ineffective. Of 56 gram varieties tested for wilt resistance, the Imperial Pusa Types 9, 28, and 52 were highly susceptible, I.P. 28 was intermediate, and I.P. 22, 63, 69, and 83 showed no infection. I.P. 78 was unaffected in 1939, but had 32 per cent. infection in the season under review.

A species of *Fusarium* quite distinct from *F. orthoceras* var. *ciceri* was isolated from wilted lentil plants at Delhi and Karnal and from certain gram varieties in the latter place. In inoculation experiments it caused wilt of both lentil and gram, though *F. orthoceras* var. *ciceri* infected only gram.

Linseed was found to be infected with *Oidium lini* [cf. ibid., xiii. p. 515], a new record for India.

Of 249 potato varieties and hybrids tested against *Alternaria solani*, 8 were completely resistant and 91 only very mildly affected. *Phytophthora parasitica* was isolated from the leaves and petioles of potato plants at Simla reported to show late blight. It tolerated temperatures

of 33° to 34° C. Infection tests on tubers and leaves gave positive results, and the fungus was reisolated. It readily attacked tomatoes. True late blight at Simla and elsewhere was due to *P. infestans*.

The total number of isolates so far obtained from potato tubers found rotting at the Potato-breeding Sub-station, Simla, amounts to 486, of which 442 are species of *Fusarium*. Two species of *Fusarium* appear to predominate, one represented by 165 and the other by 109 isolates. Inoculations of Darjeeling, Gola, Great Scot, and Phulwa tubers with its different *Fusarium* isolates showed that all infected tubers of the four varieties, two giving 100 per cent. infection on all four.

P. parasitica was isolated from brinjal [eggplant] fruits and seedlings.

Fifteenth Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1940–41.—92 pp., 2 maps, 1941.

On p. 9 of this report [cf. *R.A.M.*, xix, p. 643] T. R. Vernon states that tests on the storage of cheese [ibid., xiv, p. 443] showed that no mould developed on cheese kept in an insulated room in which the temperature was controlled and the atmospheric humidity maintained at 80 to 85 per cent., while very occasional mould [unspecified] was noted in an uninsulated, uncontrolled room, in which humidity ranged from 50 to 95 per cent., and considerable mould developed in an insulated, uncontrolled room where the humidity varied from 65 to 95 per cent. The results indicate that a new design of storage room should be adopted with insulation, low ceilings, no windows, and automatic temperature and humidity control.

G. H. Cunningham (pp. 23–26) lists among new diseases recorded *Bacterium* [*Xanthomonas*] *pruni* (probably introduced from the United States) on several varieties of Japanese plums, *Beta* virus 2 (Smith) [beet yellows virus] on sugar beet and mangold, an unidentified virus disease of rhubarb, which will probably destroy the Canterbury industry if left unchecked, and carnation ring spot (*Heterosporium echinulatum*) [*Didymellina dianthi*: ibid., xvi, p. 255; xvii, p. 506]; all were introduced with plants or seeds from overseas.

It was ascertained that the fungus causing blind seed disease (*Helotium* sp.) [ibid., xx, p. 263] of rye grass [*Lolium perenne* and *L. multiflorum*] does not perennate within the vegetative tissues of the plant, and slime conidia, after drying, lose their germinative ability within one month. Hence, infection of the new seed crop must arise entirely from ascospores produced by blind seeds shed or sown in the previous autumn. The identity of the endophyte of *L. perenne* [ibid., xix, p. 224; xx, p. 122] remains obscure; microspores morphologically resembling those of *Endoconidium temulentum* were isolated in pure culture, but no other spore stage was observed.

Both tall and meadow fescue [*Festuca elatior* and *F. pratensis*] were observed to be permeated with a seed-borne endophyte resembling the fungus of perennial rye grass. Tall fescue except in one or two parts of Otago and Southland is infected everywhere in New Zealand, but shows no outward sign. The organism was invariably cultured from seeds and stems, and has a conidial stage identical with that of *Epichloe typhina* [ibid., xiv, p. 766].

A strain of *Claviceps purpurea* from Hungarian commercial ergot

(probably from rye) gave heavy infection when a conidial suspension was sprayed on to rye blossoms. When the same strain was used on small field plots, one, two, and three applications yielded, respectively, 115, 140, and 176 lb. of air-dried ergot per acre. The ergot produced, however, was entirely lacking in alkaloids.

Surveys of some 14,000 acres planted to linen-flax showed the presence of browning (*Polyspora lini*) [ibid., xx, pp. 195, 261], rust (*Melampsora lini*) [ibid., xx, pp. 195, 294], wilt (*Fusarium lini*) [ibid., xx, p. 408], foot rot of unknown origin, and 'pasmo' (*Sphaerella linicola*) [*S. linorum*: ibid., xviii, p. 112; xx, p. 18]. *P. lini* was general in Southland, but troublesome only on crops sown in October. It was also found on *Linum monogynum*. *M. lini* was present in most crops in Marlborough and Canterbury, but was not found in Otago or Southland. Very little damage was done to the fibre. The fungus was also found on *L. monogynum*. *F. lini* was found in one crop at Oxford, Canterbury, and three in the Winton district of Southland. *S. linorum* was isolated from plants grown at Owairaka from seed obtained from commercial lines grown at Blenheim. The symptoms of pasmo so closely resembled those due to browning that pasmo may have been mistaken for browning during the survey.

Tests were made under commercial glasshouse conditions with three tomato varieties reputedly immune from leaf mould (*Cladosporium fulvum*) [ibid., xx, p. 246]. Kondine Red was used as a control, duplicate plots of which were sprayed with shirlan AG. The results showed that Kondine unsprayed, Kondine sprayed, one immune variety, and a second immune variety yielded, respectively, 2 lb. 5 oz., 3 lb. 4 oz., 5 lb., and 5 lb. 11 oz. per plant. Selections of one immune variety have been made for commercial seed production.

In a glasshouse experiment in which soil was artificially infected with *Verticillium albo-atrum*, tomatoes in the control plots showed 100 per cent. infection, while those in the soil treated with formalin solution (1 in 50 and 1 in 80) were completely unaffected. It was found necessary to apply the solution at the rate of 50 gals. per 15 sq. yds. soil, as the ground had to be saturated before satisfactory results were secured.

Jonathan apples developed a minor outbreak of bud and blossom rot due to *Fusarium lateritium*. Evidence was obtained confirming the view that *Phoma pomi* [ibid., xvii, p. 465] overwinters on or in apple buds; an application of Bordeaux mixture at the green-tip stage considerably reduces foliage infection in spring.

Strawberry yellow edge [ibid., xx, p. 72 and below, p. 28] and the two forms of crinkle [mild and severe: ibid., xix, p. 717] were found to be transmitted by *Capitophorus potentillae* and not by *Tetranychus telarius*.

Citrus fruits dipped in shirlan WS (0·25, 0·5, and 1 per cent.) showed not more than 6·5 per cent. infection by *Penicillium digitatum*, as against 32 per cent. for the untreated controls.

At the Dominion Laboratory gas storage again completely controlled Jonathan spot of apples [ibid., xix, p. 644]. The use of nitrogen in manurial treatments at the Appleby Research Orchard increased breakdown and fungal infection in Cox's Orange Pippin apples [ibid., xix, p. 645], but decreased wilt. Fruit from Jonathan trees given heavy

potash dressings in 1933 and 1934 still showed greatly reduced breakdown and fungal infection, but more wilt, and rather more slight Jonathan spot. Phosphate applications again reduced breakdown incidence in Sturmer apples, and did not appreciably increase wilt. Nitrogen with and without phosphate induced a sharp rise in the amount of breakdown and a small reduction in the amount of wilt.

RICHARDSON (A. S.). **Report of the Director of Agriculture.**—*Rep. Dep. Agric. Nyasald, 1940*, pp. 5–20, 1941.

In this report [cf. *R.A.M.*, xx, p. 113] it is stated (p. 10) that during 1940 the cotton crop in Nyasaland remained very largely free from angular leaf spot (*Bacterium* [*Xanthomonas*] *malvacearum*) and direct bacterial lesions on the bolls, staining being found to be due to *Nematospora gossypii*. Groundnut rosette was serious throughout the Protectorate. A species of *Dothiorella*, possibly *D.* [*Botryosphaeria*] *ribis*, was associated with a branch and twig canker of tung oil trees (*Aleurites* spp.) on a number of estates [cf. ibid., xv, p. 514] and a stem canker appeared to be caused by *Fusarium lateritium*.

MILBRATH (D. G.). **Bureau of Plant Pathology.**—ex *Rep. Calif. Dep. Agric. 1940* (*Bull. Dep. Agric. Calif.*, xxix, 4), pp. 268–282, 1940.

In this report [cf. *R.A.M.*, xix, p. 692] it is stated that during 1940, 4,720 new cases of peach mosaic were found in California; by the end of the year only 354 remained, after a concerted eradication effort.

The control of western celery mosaic [ibid., xx, p. 346] by an enforced celery-free period was continued in three separate areas. In the Venice-Culver City district the yield per acre in 1940 amounted to 1,000 half-crates, as against 1,100 in 1939. The slight decrease was due to adverse weather conditions. The causal organism of chestnut blight [*Endothia parasitica*: ibid., xvii, p. 798] appears to be spread by rain and irrigation water.

Pierce's disease of grapes [ibid., xix, p. 693] became more widely distributed and spread rapidly in individual vineyards; it causes rapid decline and death on most commercial varieties in one to three years. The area most affected has been the source of much propagation stock.

To assist growers to obtain seed free from bacterial ring rot [*Bacterium sepedonicum*: ibid., xx, p. 562], which was again general in potatoes grown in California and other States, arrangements were made for seed-testing, field inspection, and close co-operation with the Seed Potato Certification Service. Control lies in building up a healthy foundation stock by seed-growers.

Cantaloupe melons in the Imperial Valley were affected more severely than for some years past by powdery mildew [*Erysiphe cichoracearum*: ibid., xix, p. 578]. The variety selected and bred for resistance failed to produce disease-free vines. Either a new strain of the fungus may have been present, or a suppressed strain had become active again. In breeding work for resistance the participation of growers had to be obtained, because of the absence of a seed stock of commercially desirable cantaloupes as resistant as Cantaloupe No. 45 had been to the strain formerly prevalent.

Watermelons in the Imperial Valley developed very severe mosaic

[ibid., xiii, p. 146]. More than one virus appeared to be involved. Plants infected in the early stages of growth either produce no melons or distorted, unmarketable fruit. The symptoms vary greatly: on some vines the fruits are misshapen and mottled, while on others they remain normal, though the leaves are mottled. There exists a reservoir of virus material in volunteer melon vines, wild cucurbits, and viruliferous insects.

New and uncommon diseases included *Phytomonas* [*Xanthomonas*] *begoniae* on *Begonia* and *Physalospora cydoniae* on *Pyrus* sp.

GODFREY (G. H.). **Noteworthy diseases of economic crops and native plants in Lower Rio Grande Valley in the spring of 1941.**—*Plant Dis. Reptr*, xxv, 13, pp. 347–353, 1941. [Mimeographed.]

This report includes, among others, the following items of interest. Slight damage was caused in a small pepper [*Capsicum annuum*] seedbed at the Lower Rio Grande Valley Experiment Station, Weslaco, Texas, by *Peronospora tabacina*, but the outbreak was checked by a single dusting with red copper oxide, and there was no recurrence. *Nicotiana repanda*, a native wild tobacco growing profusely as a weed, was frequently found to be infected by *P. tabacina* and the same disease was also present in the Robstown area, 150 miles north of the Valley. This first record of *P. tabacina* from Texas indicates that the area concerned may have been one step in the possible migration of the fungus from southern California to the tobacco sections of the south-eastern States [cf. *R.A.M.*, xiii, p. 602]. Flax, including the Argentine varieties, was attacked extensively in the field by *Sphaerella linorum* [see above, p. 3].

FAWCETT (G. L.). **Departamento de Botánica y Fitopatología. *Ex* Memoria anual del año 1940.** [Department of Botany and Phytopathology. *Ex* Annual Report for the year 1940.]—*Rev. industr. agríc. Tucumán*, xxxi, 1–3, pp. 47–50, 1 fig., 1941.

The following items of interest are included in this report [cf. *R.A.M.*, xx, p. 105]. During 1940 sugar-cane in Tucumán was attacked by a fungus not hitherto reported from the Argentine, viz., *Ustilago* (?) *sacchari* [*U.* (?) *scitaminea*], the damage caused by which has so far not been extensive.

A species of *Pythium* has been isolated from the decayed roots of chick peas [*Cicer arietinum*] in the Trancas district, where gaps in the stand due to an as yet unexplained disease occur annually in the same spots. A *Rhizoctonia* is responsible for similar injury to this crop under humid conditions.

In addition to 'corcova' [hunchback: ibid., xx, p. 501], *Septoria lycopersici* was prevalent in the tomato crops. Bordeaux mixture, applied in good time, affords certain protection against the disease, which is usually overlooked, however, until the leaves have fallen. Experiments in spraying with lime alone (1 to 2 in 100) gave promising results, the drawback to this method being the need for repeated applications following heavy rains which wash off the deposit.

White (P. R.) & Braun (A. C.). **Crown gall production by bacteria-free tumor tissues.**—*Science*, N.S., xciv, 2436, pp. 239–241, 1941.

Tissue fragments from the interior of a series of secondary tumours caused by *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xx, p. 198] were removed aseptically [? from sunflower plants] and inserted in 125 ml. Erlenmeyer flasks containing 50 ml. of White's standard glycine-thiamin nutrient stiffened with 0·6 per cent. of well-leached agar. Of 37 isolations from large secondary tumours from the stems at nodes 19 grew. Six isolations were carried through three or more passages, being divided at each passage, and one strain through 13 successive passages, theoretically increasing in volume approximately 450,000 times. Of the 482 cultures none developed any bacterial growth and attempts to isolate bacteria consistently failed. When the cultures were triturated and the paste was injected into sunflower or tomato plants, no galls developed, though they constantly appeared when paste from young primary tumours was injected. These results appear to establish the capacity of these tissues for autonomous growth.

Cultures of cambial and procambial tissues from healthy sunflowers were maintained for nine weeks and carried through five passages, but the volume increase was only about 30 times.

After five successive passages *in vitro* 10 tumour cultures were grafted back into young, healthy sunflower plants. After 7 weeks 5 implants had grown into typical crown gall tumours up to 1 cm. in diameter. Similar results were obtained with cultures from the sixth and tenth passages. Attempts to isolate bacteria from one tumour by grinding and plating failed. These results indicate that gall tissues differ from normal tissues in their capacity to produce galls and by their behaviour *in vitro*. These characteristics are clearly induced by some stimulus from *Bact. tumefaciens*, but are not dependent upon the continued presence of the bacteria.

Garcés (C.). **Informe sobre la situación patológica de los Cacaotales en los Departamentos de Valle y Cauca.** [Memorandum respecting the pathological status of the Cacao plantations in the Valle and Cauca Departments.]—*Rev. Fac. nac. Agron. Colombia*, iv, 12, pp. 1280–1300, 1941.

The following cacao diseases were observed by the author during a tour in 1939 through the Departments of Valle and Cauca, Colombia, the plantations of the former comprising some 3,600,000 and those of the latter 2,000,000 trees in production. Root rots occur throughout the area visited, but their symptomatology is confused and their etiology obscure.

Phytophthora faberi [*P. palmivora*] is responsible for heavy damage, affecting a minimum of 90 per cent. of the trees in some plantations and producing cankers up to 2 m. in length; in other cases the trunks bore up to five lesions over a length of 1 m., bringing production to a standstill through progressive debility. Infection of the pods in rainy seasons may involve losses of 40 per cent. of the crop.

Corticium salmonicolor is of little importance except in the Digua Valley, where the extremely humid conditions are more conducive to the development of the pathogen than those prevailing in Calle and Cauca.

'Die-back', like 'root rot', is a generic term for a group of disorders of varying origin, characterized essentially by progressive desiccation from the top downwards and favoured by such factors as drought, excessive humidity, bad drainage and poverty of the soil, exposure to wind, insufficient shade, cortical injuries from agricultural implements, and the like.

Bacterium tumefaciens is believed to be the agent of incipient hypertrophy of the floral cushion, of no importance at the moment in the districts under observation but causing heavy damage elsewhere in the country (Department of Antioquia) by the suppression of pod formation.

The agent of brown rot (*Diplodia*) [? *cacaoicola* = *Botryodiplodia theobromae*: *R.A.M.*, xviii, p. 12] is a weak parasite of ripe pods bearing wounds or scarifications of diverse origin, on which it produces symptoms very similar to those of *P. palmivora*.

Monilia or swamp disease [? *M. roreri*: ibid., xvii, p. 801] is stated to be assuming an alarmingly grave character in the two Departments visited, causing losses exceeding 90 per cent. of the crop.

Anthracnose (*Colletotrichum*) [ibid., xviii, p. 12] is fairly widespread but unimportant, except in the rare cases in which it penetrates to the seed, causing blackening and death.

One of the author's principal objectives was to investigate the suspected occurrence of witches' broom [*Marasmius perniciosus*] in the Valle and Cauca plantations, where this much dreaded fungus, however, does not seem to be present, the so-called 'palm' disease being distinguishable as follows. The chupons are in both cases abnormally slender, but in 'palm' disease they are not branched, as in witches' broom, and they persist for more than six months, the maximum period of retention in trees attacked by *M. perniciosus*. The leaves of 'palm'-diseased plants are of normal size and turgid, in contrast to the dwarfed, flaccid foliage of witches' broom, while in the former disease the flowers are likewise normal, whereas in the latter they are abortive and stellate. Pods on 'palm'-diseased trees show none of the malformations, blackened areas, or hard places associated with witches' broom. Finally, on no occasion were old brooms, bearing the sporophores of the fungus, present in 'palm'-diseased trees. Another spurious form of witches' broom has been reported in the above-mentioned Digua Valley, where some 20,000 cacao trees are in cultivation, largely of the Antillano variety. The malady in question originated on the estate of a German grower, who termed it 'witches' broom' from the descriptions given in German text-books of a condition attributed to this cause in the Cameroons and certain English possessions, but actually distinct from the Surinam disease. The affected trees in the Digua Valley bear chupons attaining a length of up to 2·80 m., generally almost destitute of leaves and branching irregularly, the short branches with slender bases turning over and producing, usually unilaterally, a series of twigs which undergo rapid lignification and decay at the tips, such foliage as develops being dark green and stunted. Notwithstanding the slow progress of this disease and its relatively innocuous character at the moment, precautions should be taken to exclude it from the Valle and Cauca plantations by prohibiting the use of Digua seed, since the trouble may well assume a more serious aspect. The

principal shade trees grown in Colombian cacao plantations are *Erythrina* (?) *glauca* and *E.* (?) *poepigiana*, of which the former suffers from (*a*) bark rot associated, *inter alia*, with *Pleurotus*, *Polystictus*, and *Ganoderma* spp., but possibly of bacterial origin, and characterized by necrotic, malodorous lesions, up to 20 by 10 to 15 cm., causing gradual detachment of the cortex from the woody cylinder, desiccation, and total defoliation; and (*b*) the rust *Dicheirinia binata* (Berk.) Brth., producing on the young leaves and shoots pustules and large swellings which result in the shedding of the foliage: the latter is affected by leaf spots of no immediate importance due to *Cercospora erythrinae* and *Metasphaeria* sp.

Miles (L. E.). **Downy mildew on Oats in Mississippi.**—Abs. in *Phytopathology*, xxxi, 8, p. 768, 1941.

In the late spring of 1939 *Sclerospora macrospora* [*R.A.M.*, xiii, p. 804] was observed in Sunflower County, Mississippi, and in 1940 four more counties were found to be involved, in one of which a few volunteer wheat plants also showed infection. This is stated to be the first record of downy mildew on oats in the United States, and the first report of its occurrence on wheat in Mississippi. Diseased plants assume a stiff habit of growth, the leaves being abnormally fleshy and erect. No viable seed is produced, and the fruiting panicles are often much distorted. The rachis and rachilla become contorted, and the spikelets produce a single seed-like structure in the glumes in place of the normal two seeds in close contact. The diameter of the oospores (the only sexual organs present) was found to agree fairly closely with that of specimens from cereals, rice, and wild grasses from various parts of the United States, Italy, Japan, and Australia, though all the Japanese collections and one on *Avena fatua* from New South Wales averaged much smaller.

Coffman (F. A.), Humphrey (H. B.), & Murphy (H. C.). **New Red Oats for fall seeding resistant to rusts and smuts.**—*J. Amer. Soc. Agron.*, xxxiii, 10, pp. 872–882, 1 fig., 1941.

In addition to the three varieties of red oats already released for distribution and combining resistance to smuts [*Ustilago avenae* and *U. kolleri*] and crown rust [*Puccinia coronata*] with other desirable qualities, viz., Fultex, Ranger, and Rustler [*R.A.M.*, xx, p. 357], it is stated that in several selections from crosses involving Richland, Victoria, and Red Rust-proof, the stem rust [*P. graminis*] resistance of the first-named, the crown rust and smut resistance of the second, and the winter hardiness and other acceptable characters of the third have been successfully combined. Preliminary observations further indicate that certain segregates of other crosses may prove well adapted to autumn sowing in the extreme south of the United States.

Fomin (E. E.) & Nemlienko (F. E.). 'Черный зародыш' семян хлебных злаков. ['Black radicle' of cereal seed-grain.]—*Селекция и семеноводство* [*Selection and Seed-growing*], *1940*, 10, pp. 30–32, 3 figs., 1940.

A 'black radicle' [? = black point] disease of cereals is reported

from the Ukraine, causing considerably reduced stands of barley and spring wheat and, in a lesser degree, of winter wheat and oats. In experiments with spring wheat there was a reduction in emergence of 27 per cent. The tips of diseased grains, round the radicle, were black or brown; the seed either failed to germinate or more often produced weak and stunted seedlings, the underground parts of which showed interrupted yellow-brownish streaks, while the roots were poorly developed. An analysis of 132 samples of cereal seed from various farms showed in some cases 40 per cent. infected grains. Barley and spring wheat with 11 to 32 per cent. infection gave 55 to 82 per cent. emergence and barley with 32 to 36 per cent. infection 75 to 84 per cent. emergence. The disease is stated to be due to a number of factors and to be caused by various micro-organisms, chiefly *Helminthosporium sativum* and an undetermined species of *Alternaria*. In samples of diseased grain 28·5 to 94·8 per cent. were infected by *H. sativum*, 5·2 to 64·3 per cent. by *Alternaria* sp., and 0·0 to 13·6 per cent. by unidentified bacteria and fungi. In grain infected by *H. sativum* the blackening often expanded from the radicle to other parts of the seed, which usually became somewhat shrivelled; the mycelium of the fungus permeated the tissues of the pericarp, endosperm, and the radicle, and penetrated, after emergence of the seedling, into the stem and root, but not beyond a distance of 10 cm. from the seed. In grain infected by *Alternaria* sp., the blackening was usually restricted to the area around the radicle, the seed remained unshrivelled, and the mycelium of the fungus was found only in the pericarp and very rarely in the endosperm. The external symptoms produced by the two pathogens, however, varied considerably and rendered differentiation difficult except by culturing. In trials with spring and winter wheats some varieties showed only negligible infection and are considered promising for breeding work. In control experiments soaking the seed in a 0·1 per cent. solution of mercuric chloride for 5 minutes reduced infection to 3·1 per cent. and thermal disinfection (soaking for 4 hours at 30° C. and then heating for 8 minutes at 52°) to 30 per cent. Mercuric compounds are, however, considered too highly toxic for practical use and thermal disinfection is recommended. Further measures of control should include regular weeding of wild grass hosts, immediate drying of moist seeds after harvest, prompt removal of harvested cereals from the field, deep ploughing, and agrotechnical methods to ensure a vigorous development of the plants.

Soukhoff (K. S.). 'Закукливание 'злаков. ['Pupation' of cereal crops.] —*Селекция и семеноводство*. [*Selection and Seed-growing*], *1940*, 11–12, pp. 30–33, 3 figs., 1940.

This is an up-to-date summary of results and conclusions regarding the epidemiology and the nature of the pupation disease of cereal crops in Siberia [*R.A.M.*, xx, p. 155], on the basis of which the following recommendations are given for control: (1) ploughing in the stubble of late oats and millet [*Panicum miliaceum*] directly after harvest and ploughing a surrounding strip of ground, in order to starve the larvae of the vector; (2) healthy seed should be sown densely to ensure good stands, which are unfavourable for epidemics of the

disease; and (3) fallow land should be kept clear of weeds in which the virus could survive for long periods.

Gadd (I.) & Kjaer (A.). **Über die Verwendbarkeit der Selen- und Indigokarminmethoden bei der Prüfung von Frost- und Fusariumgeschädigtem Getreide.** [On the applicability of the selenite and indigo-carmine methods to the testing of frost- and *Fusarium*-damaged cereal seed-grain.]—*Proc. int. Seed Test. Ass.*, xii, 2, pp. 140–149, 1940. [English summary.]

In the writers' dual staining method cereal (wheat, barley, and oats) seeds (400 per sample), cut lengthways, were placed after 24 hours' pre-soaking in a mixture of equal parts of a 1 per cent. solution of sodium biselenite and 0·25 per cent. indigo-carmine, in which they were left for another 24 hours. By the end of this time the live tissues of the cut embryo surfaces had assumed a red, and the dead ones a blue, tinge. In the case of primary infection by *Fusarium* the embryos are dead, whereas secondary infection involves only the glumes and outer cell layer of the caryopsis, leaving the embryo alive. In such samples, however, the coleoptile and roots will give rise to abnormal seedlings, and therefore the germination values forecast on the basis of the selenite staining method are apt to be too high, the same being true of frost-damaged material. In laboratory tests of the germinating capacity of damaged samples only quite normal sprouts should be counted.

Leukel (R. W.) & Nelson (O. A.). **The use of chlorine gas as a seed disinfectant.**—*Circ. U.S. Dep. Agric.* 576, 16 pp., 1 diag., 1940.

A detailed, tabulated account is given of a series of laboratory and commercial trials at the Arlington Experiment Farm, Virginia, on the efficacy of chlorine gas as a cereal seed-grain disinfectant [*R.A.M.*, xix, p. 75]. Bunt (*Tilletia* spp.) [*T. caries* and *T. foetida*] in Baart and Purplestraw wheat was adequately controlled by two hours' exposure of the seed-grain to chlorine concentrations of 3 to 9 per cent., while one hour at 10 per cent. sufficed to eliminate covered smut of Chiltex sorghum (*Sphacelotheca sorghi*). Oats and barley smuts (*Ustilago levis* [*U. kolleri*] and *U. hordei*) were not appreciably affected by the treatment, irrespective of the gas concentration or length of exposure. In order to secure satisfactory destruction of surface-borne smut spores without injury to the seed-grain, the volume of gas should not be less than 20 or more than 40 per cent. of the net volume of the seed.

Nieschlag (F.). **Über die Wirkung der schwefelsauren Salze des Kupfers, des Mangans, des Magnesiums, des Eisens, des Aluminiums, und des Kalks auf heidemoorkranken Böden.** [On the effect of the sulphates of copper, manganese, magnesium, iron, aluminium, and lime on reclamation disease-producing soils.]—*Bodenk. u. PflErnähr.*, N.F., xxiii, 5–6, pp. 350–356, 1941.

A tabulated account is given of experiments covering the period from 1936 to 1940 at the Oldenburg Agricultural Research Station on the response of black oats (1936 and 1940) and winter rye (1937, 1938, and 1939) to treatments of two types of soil (sand with a rich admixture of

humus and pulverized moorland) with copper, manganese, magnesium, iron, aluminium, and calcium sulphates at the rates of 50 and 100 kg. per ha., potash, alum, and gypsum also being included in some of the tests. The crops responded favourably not only to copper sulphate [*R.A.M.*, xx, p. 351], but also to the iron, aluminium, manganese, magnesium, and calcium treatments, the average increases in the grain yields for the five-year period, reckoned in doppelzentner [100 kg.] per ha., being 5·37±0·89, 1·76±0·80, 4·39±0·82, 1·73±0·96, 4·28± 0·75, and 2·66±1·00, respectively. It is pointed out, however, that a specific remedial effect on the disease can be ascribed only to copper sulphate. The stimulating effect of magnesium on the yield is attributed to the correction by the treatment of the deficiency of this element in the soil, and that of iron and manganese to an indirect influence in the form of assistance in the assimilation of copper; the beneficial action of aluminium is not easy to interpret, but it may be connected with a favourable exchange with the silicic acid content of the soil. The reason for the large increases of grain yield obtained in the alum-treated plots, averaging (in dz. per ha.) 4·64±3·43 and 3·34±2·57 for the half and full rates of application, respectively, for oats and 4·49±1·52 and 4·69±0·93, respectively, for rye, is also obscure. Gypsum tended to stimulate the grain yields on the acid (P_H 4·5) sandy soil. There is some reason to believe that the sulphate ions modify the soil humus in such a way as to afford better conditions for the growth of the crops.

Winter (A. G.). **Die Infektion des Weizens durch Ophiobolus graminis als Funktion der Temperatur.** [The infection of Wheat by *Ophiobolus graminis* as a function of temperature.]—*Z. PflKrankh.*, l, pp. 444–459, 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, ciii, 21–24, p. 413, 1941.]

In inoculation experiments with *Ophiobolus graminis* on wheat [*R.A.M.*, xix, p. 465] at 10°, 16°, and 22° C. the incidence of infection in sterilized humus soil increased parallel with rising temperatures. In soils with a low humus content the influence of temperatures below 16° was weaker and above this point stronger than in those with an abundance of humus. In non-sterilized soils the incidence of infection even at the higher temperatures was less than in a sterilized medium, due to the presence in the former of antagonistic micro-organisms and the more rapid disintegration of the inoculum. The influence of soil moisture increases with the approximation of the temperature to the optimum.

Fischer (G. W.) & Holton (C. S.). **Inheritance of sorus characters in hybrids between Ustilago avenae and U. perennans.**—*Mycologia*, xxxiii, 5, pp. 555–567, 3 figs., 1941.

In successful hybridization experiments in the United States crosses between *Ustilago avenae* and *U. perennans* [*R.A.M.*, xx, p. 526] were made which involved four sorus characters. The naked and powdery characters were found to be dominant over covered and indurate, respectively. Independent inheritance of these characters was indicated by the production in the F_2 generation of naked powdery, naked indurate, covered powdery, and covered indurate segregates. In the

F_3 generation the naked powdery segregate gave rise to all four of the above-mentioned types of segregates; the naked indurate segregate produced the naked indurate and covered indurate types; the covered powdery segregate gave covered powdery and covered indurate types; and the covered indurate segregate yielded only the covered indurate type of sorus. In crosses of *U. perennans* with a race of *U. avenae* having normal powdery sori, the naked sorus character was again dominant over the covered sorus character. Cultivated oats were susceptible to *U. perennans*, but tall oatgrass (*Arrhenatherum elatius*) [*A. avenaceum*] was resistant to both *U. avenae* and the hybrids between the two smuts. The two species of smut are considered to be synonymous by virtue of the morphological identity of their chlamydospores, their genetic relationship, and host range. The name *U. avenae* is recognized for the consolidated species, while *U. perennans* is considered to be a race of the former.

Robbins (W. J.) & Ma (Roberta). **Biotin and the growth of Fusarium avenaceum.**—*Bull. Torrey bot. Cl.*, lxviii, 7, pp. 446–462, 6 figs., 1941.

A strain of *Fusarium avenaceum* supplied by E. R. Vitoria from the Argentine failed to grow in a mineral-sugar solution which constituted a satisfactory medium for two other isolates of the same fungus from the United States. The first-named strain developed rapidly when the original substratum was enriched with 1·5 per cent. purified Difco agar, the beneficial effect of which is attributed in part to its biotin content [cf. *R.A.M.*, xviii, p. 542], amounting in some samples to as much as 0·1 mg. per gm., while other unidentified growth substances are also believed to be concerned in the improved growth of the organism. All or nearly all the biotin was removed from the agar by extraction with aqueous pyridin.

Nemlienko (F. E.). Экологические факторы и пузырчатая головня Кукурузы. [Ecological factors and blister smut of Maize.]—*C.R. Pan-Sov. V. I. Lenin Acad. agric. Sci., Moscow, 1941*, 5, pp. 39–41, 1941.

Meteorological data collected over four years (1932 to 1935) in the Ukraine showed that in the first two years when the precipitation was greater by 100 mm., and the air and soil humidities higher by 15·5 and 5 per cent., respectively, than in the following two, the percentage of blister smut of maize [*Ustilago zeae*: *R.A.M.*, xvi, p. 36] was much lower (8·4 to 8·6 per cent. as against 17·7 to 20·2 per cent.). Similarly, in 1934, the disease was found to be more prevalent in dry districts (16·1 per cent.) than in more humid ones (0·7 per cent.), the corresponding figures for 1933 being 9·3 and 0·3 per cent. These data are explained on the basis of an increased susceptibility of plants suffering from lack of water.

Bliss (D. E.). **Artificial inoculation of plants with Armillaria mellea.**—Abs. in *Phytopathology*, xxxi, 9, p. 859, 1941.

Infection of healthy citrus roots by *Armillaria mellea* was obtained only with pure cultures of the fungus on the wood of the host, those

on nutrient agar and bran, as well as detached rhizomorphs, being non-pathogenic. The rhizomorphs developed in soils of widely differing types and reactions, e.g., peat at P_H4 and sand at P_H8. Rotted, non-sterile manure was penetrated, but apparently not utilized as a source of food. Within a year the rhizomorphs grew to a depth of 67 cm. in sterile glucose-potato agar, but on the exclusion of air from the surface their development was instantly arrested and death ensued. *Trichoderma lignorum* [*T. viride*: cf. *R.A.M.*, xx, p. 508] suppressed the growth of *A. mellea* on agar, but failed to destroy the organism in wood after the formation of a pseudo-sclerotium. The California pepper tree (*Schinus molle*) contracted infection after 71 days in comparatively moist soil at 20° C.

Diphenyl-treated Orange wrappers.—*Chem. Tr. J.*, cix, 2833, p. 114. 1941.

The experiments initiated some five years ago by A. Farkas, of the Hebrew University, Jerusalem, on the use of diphenyl-treated wrappers for the prevention of decay in oranges during transit [*R.A.M.*, xix, p. 87] are stated to have been continued since the outbreak of the war. In the 1938–9 season spoilage in a test shipment of Palestine fruit wrapped in impregnated paper amounted to only 0·33 per cent. compared with 4·4 in a corresponding lot for which ordinary paper was used, and similar data were obtained in large-scale trials in 1939–40, when nearly 90,000 cases of oranges were exported from Palestine in treated wrappers.

Special importance attaches to these results at the present juncture, when transport to Europe is liable to abnormal delays. The new treatment has also proved satisfactory in South Africa, California, Cyprus, and Australia. Official tests conducted on behalf of the Minister of Agriculture, New South Wales, showed the incidence of rot in oranges to be significantly reduced by the use of impregnated paper without any sacrifice of appearance, aroma, or flavour, while the chemical has been proved to be completely innocuous at concentrations several times the strength of those to which workers are exposed in the manufacture or employment of the wrappers.

Bliss (D. E.). **A new species of Ceratostomella on the Date Palm.**—*Mycologia*, xxxiii, 5, pp. 468–482, 9 figs., 3 graphs, 1941.

From the roots and trunk of date palms affected by the disease known as wilting or sudden death in the Coachella Valley of California a new species of *Ceratostomella* has been isolated and is named *C. radicicola* [*R.A.M.*, xvi, p. 314]. The flask-shaped, solitary perithecia comprise a faintly coloured, nearly spherical bulb, 180 to 320 μ in diameter, partially or completely submerged, with none to many, dark, variously branched appendages, 35 to 90 μ long, and a dark beak, becoming hyaline and fimbriate at the apex, tapering, 440 to 980 μ long, 24 to 71 μ in diameter; the asci are deliquescent and the hyaline, elliptical, unequally convex-sided, continuous ascospores, 8 to 15 by 2·5 to 4 μ in diameter, are found in groups of eight or less. The species is heterothallic, and has an imperfect stage, a *Chalaropsis*, with erect, vase-shaped, uni- to triseptate endoconidiophores, 100 to 190 by 7 to

10 μ, forming at the tip continuous, hyaline endoconidia, variable in size, mostly 8 to 15 by 6 to 10 μ, cylindrical with flattened or rounded ends often collecting in slimy masses; macroconidia develop on procumbent conidiophores with sympodial branching and are hyaline, then dark brown, thick-walled, continuous, ovate to ovoid with a flattened base, mostly 15 to 22 by 11 to 16 μ, borne singly on short hyphae maturing in acropetal succession. In pure culture the colonies of *Ceratostomella radicicola* varied from light grey to black, with a dense growth on glucose-potato agar and a comparatively sparse one on maize meal agar. New colonies developed rapidly under favourable conditions and young endosporophores were produced within a few hours from the time of spore germination, macrospores appearing only a little later. Perithecia were obtained only on artificial media. Attempts to infect date palms with *C. radicicola* gave definite evidence of pathogenicity. The species differs from *C. thielavioides* in its more rapid growth on maize meal agar, its abundant production of macrospores, its wide temperature range, and statistically significant differences in length and width of the endospores and macrospores..

Miller (P. R.) & Weindling (R.). **A survey of Cotton seedling diseases in 1941 and the fungi associated with them.**—*Plant Dis. Reptr*, xxv, 14, pp. 378–380, 1 map, 1941. [Mimeographed.]

During 1941, the fourth consecutive year of the cotton seedling disease survey [*R.A.M.*, xx, p. 14], *Glomerella gossypii*, once more the predominant pathogen, extended its range slightly to the westward of previous locations in Texas and Oklahoma [ibid., xx, p. 113]. *Rhizoctonia* [*Corticium*] *solani* was more generally prevalent than during the past three seasons, the total percentages of *G. gossypii*, *Fusarium moniliforme* [*Gibberella fujikuroi*], *C. solani*, *F.* spp., *Alternaria* spp., *Diplodia gossypina*, and unidentified organisms in the 12 States covered by the survey being 36·4, 39·4, 2·8, 6·3, 0·8, 0·1, and 7·4, respectively.

Marchionatto (J. B.). **Las especies de Septobasidium en la Argentina.** [Species of *Septobasidium* in the Argentine.]—*Darwiniana, B. Aires*, v, pp. 248–263, 4 pl. (2 col.), 3 figs., 1941.

This is an annotated list of the ten species and one variety of *Septobasidium* at present known in the Argentine [cf. *R.A.M.*, xviii, p. 521], including four species and one variety new to that country, and two species new to science, *S. guaraniticum* and *S. caveniae* parasitic on scale insects on *Citrus* spp. and *Acacia cavenia*, respectively.

Petch (T.). **An Empusa on a Mite.**—*Proc. Linn. Soc. N.S.W.*, lxv, 3–4, pp. 259–260, 1940.

The author received from Mr. K. R. Norris specimens of the mite *Halotydeus destructor* killed (in Western Australia) by a species of *Empusa* with short, stout, unbranched conidiophores, and oval or subglobose primary conidia measuring, respectively, 9 to 12 by 5 to 7 and 8 by 6 μ, in each case with a broad, truncato-convex papilla. The secondary conidia were similar, and borne on a stout germ-tube from any part of the primary conidium, but usually laterally. The fungus is named *E. acarida* n.sp.

Petch (T.). **Myrophagus ucrainicus (Wize) Sparrow. A fungus new to Britain.**—Reprinted from *Naturalist, Lond.*, p. 68, 1st March, 1940.

The author states that the fungus described by him (*Trans. Brit. mycol. Soc.*, xxiii, p. 127, 1939) as *Entomophthora* (*Tarichium*) *reticulata*, and found in September, 1934, at Ingleborough, Yorkshire, in a Dipterous pupa, is the same as *Myrophagus ucrainicus* (Wize) Sparrow (Chytridiaceae). It has not previously been recorded for England.

Schaefer (E. E.). **A fungus of the family Entomophthoraceae found on Sugar Ants (Campanotus sp.).**—*Bothalia*, iv, 1, pp. 237–249, 7 pl., 1941.

Early in 1939 sugar ants (*Campanotus* sp.) in Pretoria, both living and dead, were found to show a fungal growth on the abdominal parts, identified as spores and mycelium of a strain of *Entomophthora coronata* [*R.A.M.*, xvi, p. 745]. Attempts to infect the same species of ants experimentally were unsuccessful, but the larvae all died within two days after being placed on the cultures, and were found to be full of hyphal bodies which, on new medium, gave rise to normal mycelium. The fungus was also ascertained experimentally to attack termites.

Drechsler (C.). **Some Hyphomycetes parasitic on free-living terricolous Nematodes.**—*Phytopathology*, xxxi, 9, pp. 773–802, 7 figs., 1941.

Detailed technical descriptions, accompanied by critical observations on the taxonomic and cultural features of the organisms concerned, are given of the following new species (and one new genus, *Nematoctonus*) of Hyphomycetes preying on various kinds of nematodes in leaf mould and plant debris in Maryland, Virginia, and Wisconsin: *N. tylosporus*, *N. leiosporus*, *Acrostalagmus bactrosporus*, *A. obovatus*, *Cephalosporium balanoides*, *Spicaria coccospora*, *Meria coniospora*, *Harposporium helicoides*, *H. oxycoracum*, and *H. diceraeum*.

Penta (A. Q.). **Fungous diseases of the lungs.**—*Dis. Chest*, vii, 9, pp. 292–304, 22 figs., 1941.

In the course of this survey of recent outstanding contributions to the study of fungous diseases of the lungs, associated, *inter alia*, with *Monilia* [*Candida*] *albicans*, *Torula histolytica* [*Debaryomyces neoformans*], *Blastomyces* [*?Endomyces dermatitidis*], *Coccidioides immitis*, *Sporotrichum schenckii* and *S. beurmanni*, *Aspergillus fumigatus*, *A. flavus*, and *A. niger*, and *Actinomyces bovis*, the writer points out the danger of delayed diagnosis in cases of this kind, involving a very high mortality rate. Practical directions are given for the diagnosis [*R.A.M.*, xx, p. 15] and treatment of the diseases in question.

Waldbott (G. L.), Blair (K. E.), & Ackley (A. B.). **An evaluation of the importance of fungi in respiratory allergy.**—*J. Lab. clin. Med.*, xxvi, 10, pp. 1593–1599, 3 graphs, 1941.

With the 13 genera of fungi most frequently encountered during the last three years in a survey of the air at different heights and in various habitats in the city of Detroit, Michigan [*R.A.M.*, xx, p. 166],

intradermal skin tests were performed on 841 patients with upper respiratory allergy, of whom 580 (69 per cent.) responded positively to one or more of the organisms. *Alternaria*, *Monilia* [*Candida*], *Epidermophyton*, and rust [*Puccinia*] predominated slightly over the other fungi in skin reactivity, *Torula* and *Rhizopus* being the weakest in this respect. Of 442 cultures from nasal and bronchial secretions on potato dextrose agar (P_H 5·5), 274 gave rise to fungi, *Penicillium* leading with 122, followed by *Alternaria*, *Candida*, and yeast with 62, 48, and 42, respectively. The heaviest growths were made in October and November; *Hormodendrum*, *Alternaria*, and *Aspergillus* were present only during the period from July to November. The implication of a single fungus in the etiology of respiratory allergy appeared to be extremely rare. Measured by the standard of skin reactivity, fungi share an approximately equal importance with foods, but are of much less significance than epidermals and pollen, and they mostly occur as complicating factors in multiple-sensitive patients with asthma and vasomotor rhinitis.

Gastineau (F. M.), Spolyar (L. W.), & Haynes (Edith). **Sporotrichosis : report of six cases among florists.**—*J. Amer. med. Ass.*, cxvii, 13, pp. 1074–1077, 3 figs., 1941.

Sporotrichum schenckii was isolated from lesions on the arms and hands of six florists in central Indiana, all of whom are believed to have contracted the infection from a common source, viz., sphagnum moss. C. W. Emmons isolated the fungus from one of the samples of this material submitted for examination to the United States Public Health Service.

Elliker (P. R.). **Factors influencing mold mycelia in cream.**—*Nat. Butt. Cheese J.*, xxxii, 7, pp. 8–9, 44, 46, 48, 49, 1941.

The following have been shown by the author's observations and experiments at the Department of Dairy Husbandry, Purdue University, Indiana, to be among the factors influencing mould (*Oospora lactis*) growth in cream [*R.A.M.*, xx, p. 407]. A clean centrifugal separator gives better results than water separators or hand-skimming. The cream should be kept at a temperature of 60° F. or below, especially during the summer months, when the percentage of samples with high mould mycelium counts may be considerable. The age of the cream is important in relation to its mould content, 47 per cent. of the cans examined after 7 days showing more than 4·5 mm. compared with 7 per cent. at 4 days. Cans with a fat content of 30 to 50 per cent. showed a decrease in mould growth as compared with those with less than 30 per cent. Stirring was found to reduce the mould content of the cream, but at the same time tended to impair the flavour. Large shipments, e.g., 40 lb. cream in a 5 gal. can, show less mould than smaller lots of 5 or 10 lb.

Garrison (E. R.) & Gholson (J. H.). **Mold mycelia in cream.**—Abs. in *J. Dairy Sci.*, xxiv, 6, pp. 546–547, 1941.

At the Department of Dairy Husbandry, Missouri Agricultural

Experiment Station, the authors made the following determinations on 655 cream samples collected at three-weekly intervals from October, 1940, at each of the four cream stations at Columbia: titratable acidity, formol titration, modified Wildman MBB (methylene blue-borax) test, and the plate count for mould [chiefly *Oospora lactis*: see preceding and next abstracts] on acidified potato dextrose agar. Statistical data showed a very significant correlation between titratable acidities and MBB ratings, and indicated that other factors besides the amount of mould in the cream are involved in the rating. [Udder infection and late lactation in cows of the University Herd were shown by the same writers (pp. 547–548) to be two of the factors concerned.]

Reid (W. H. E.), Edmondson (J.), & Arbuckle (W. S.). **The effect of various factors on mold mycelia in cream and butter.**—*J. Dairy Sci.*, xxiv, 6, p. 548, 1941.

At the Department of Dairy Husbandry, Missouri Agricultural Experiment Station, the writers found that mould [chiefly *Oospora lactis*] mycelia in cream [see preceding abstracts] multiply rapidly at relatively high temperatures and are very tolerant of acidity, while a direct correlation was also established between the period of keeping and the incidence of infection. Stirred samples contained more mould than non-stirred, whereas in the resultant butter the position was reversed, the mycelia having been so extensively disintegrated in the course of stirring that they could not be counted as positive fields by the MBB test.

Walter (W. G.) & Hucker (G. J.). **The use of the contact plate method to determine the microbial contamination on flat surfaces.**—*Tech. Bull. N.Y. St. agric. Exp. Sta.*, 260, 34 pp., 4 figs., 1941.

A full description is given of a contact plate method developed by the authors for determining the type and extent of bacterial contamination on flat-surfaced utensils after cleaning. The contact plate consisted of a tin can cover filled with sterile agar and kept in a Petri dish. The test was made by placing the plate in contact with the surface to be examined for four seconds and counting the colonies which developed on incubation at 32° C.

Brierley (P.). **Current-season development of virus symptoms in Tulips.**—*Phytopathology*, xxxi, 9, pp. 838–843, 1 fig., 1941.

In preliminary trials in 1938 at the United States Horticultural Station, Beltsville, Maryland, the 'strong mottle' virus of Easter lily [*Lilium longiflorum*] was inoculated from this species into *L. formosanum* by leaf-rubbing with carborundum, multiple needle puncture, and hypodermic needle injection, ten plants being used for each method and the positive reactions numbering 9, 4, and 0, respectively [*R.A.M.*, xix, p. 411]. In a parallel test with inoculum from necrotic-flecked *L. longiflorum* 8, 1, and 2 *L. formosanum* plants contracted infection, respectively. On the basis of these results leaf-rubbing was adopted as the standard method of inoculating lily viruses into plants other than tulip, for which the hypodermic needle technique was retained [ibid., xvii, p. 603].

A comparative series of greenhouse tests was carried out in March, 1939, by the two methods, with inocula consisting of a 1 : 20 dilution in tap water of expressed juice of tulip viruses 1 and 2, the latent virus of lily, the strong mottle virus of *L. longiflorum*, and several cucumber virus strains. No symptoms appeared during the current season, but in 1940 the plants arising from bulbs of the inoculated individuals developed floral or foliar disorders, the former being chiefly associated with the tulip viruses and the latter with the others tested. The percentages of infection induced by the cucumber viruses were 15·8 and 31·9 for the needle and leaf-rubbing methods, respectively, the corresponding figures for the tulip viruses and the latent and strong mottle viruses of lily, tentatively grouped with the tulip strains [ibid., xix, p. 411], being 30·9 and 59·2, respectively. Under the conditions of these experiments, therefore, the leaf-rubbing technique proved superior to the hypodermic needle for the transfer of the viruses under observation.

During January and February, 1940, forced Clara Butt tulips were inoculated by leaf-rubbing with a number of virus collections from lily and McWhorter's two tulip viruses [ibid., xvii, p. 603], the cucumber virus strains causing 41·8 per cent. infection, those from tulip 48·1, and the lily virus complexes 44·2; again, foliar symptoms developed only as a result of inoculation by the cucumber viruses (which also attacked the flowers), the others inducing current-season flower-breaking. The cucumber viruses cause a duller red striping or feathering of the flowers than that associated with the tulip strains. A conspicuous blemish is commonly present near the distal end of the outer perianth parts, and the foliage is often flecked or striped with white or grey. The most virulent strain of cucumber virus hitherto isolated from lily induced on tulips, after a month's incubation, symptoms closely resembling those described by Ainsworth in a tulip spontaneously infected by cucumber virus 1 in England [ibid., xviii, p. 182].

Laskaris (T.) & Dodge (B. O.). **Red-blotch of Hippeastrum.**—*Bull. Torrey bot. Cl.*, lxviii, 7, pp. 463–466, 5 figs., 1941.

Stagonospora curtisii, normally causing only an unimportant spotting of *Hippeastrum* foliage and flowers in the United States [*R.A.M.*, xiv, p. 448; cf. also xviii, p. 572], was in March, 1941, reported to be severely attacking a collection of these plants raised at Riverdale-on-the-Hudson from bulbs obtained from Florida. The flower stalks were badly stunted and distorted by unilateral cankers, the fungus probably entering by way of the bruises on the epidermis or underlying tissues made by sand or other foreign particles during the process of emergence of the highly compressed flower shoots from the enveloping bud scales. The cankers are of conspicuous appearance, bright red or vermilion, becoming soft, brown, and sunken at the centre as they enlarge and elongate up to several inches in length and $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter. At an advanced stage of infection the white or brownish-grey mycelium of the pathogen develops in the centre of the cankers, the borders of which retain their vivid red coloration. The elongated, red spots on the leaves and red streaks on the scapes characteristic of the normal form of the disease were also observed. Positive results were secured

in inoculation experiments with *S. curtisii* from potato dextrose agar cultures on wounded and unwounded *Hippeastrum* plants, extensive spotting following the application of the mycelium to the leaves or spraying with mycelial or pycnidial suspensions, whereas cankers developed only on shoots previously injured at the base by scraping the epidermis.

Fourteen genera of the Amaryllidaceae are known to be susceptible to infection by *S. curtisii* [ibid., xiv, p. 448].

Baker (K. F.) & Thomas (H. Earl). **Failure of Rose bud-unions caused by Chalaropsis thielavioides.**—Abs. in *Phytopathology*, xxxi, 9, p. 859, 1941.

Chalaropsis thielavioides is stated to have been largely responsible during the dry summer months of 1940 for failures in the union of rose-bud shields with Manetti and Odorata root-stocks in the Santa Clara Valley of California, the pathogen being identical with that implicated in a similar trouble in New York [*R.A.M.*, xix, p. 409]. In repeated tests the buds were rapidly killed and blackened, with only limited discoloration of the root-stock. Peyronel's strain of the fungus from lupin [ibid., vii, p. 582], Miss Hamond's walnut isolate [ibid., xiv, p. 408], and Bliss's *Ceratostomella* [*radicicola*: see above, p. 13] from date roots were non-pathogenic to Manetti stems. In the laboratory the rose strain attacked stems of *Rosa odorata*, *R. chinensis* var. *manetti*, *R. multiflora*, *R. longicuspis*, *R. nutkana*, *R. californica*, *R. gymnocarpa*, sweet cherry, peach, almond, black and Persian walnuts, pear, and *Prunus mariana*, and made slight growth on orange and quince stems and elm (*Ulmus pumila*) roots [ibid., xiv, p. 726], but stems of *R. laxa*, apple, and numerous collections of the Ragged Robin rose were immune. *R. odorata* was found to be the most susceptible of the root-stocks, followed by Manetti and *R. multiflora*.

Bond (T. E. T.). **A leaf spot disease of Annual Phlox.**—*Trop. Agriculturist*, xcvi, 6, p. 380, 1941.

With reference to his record of *Septoria drummondii* on *Phlox drummondii* in Ceylon [*R.A.M.*, xx, p. 470], the author states that a record for 1938 has now been brought to his notice.

Bender (T. R.). **Fusarium die-back of American Holly.**—*Plant Dis. Reptr*, xxv, 15, pp. 403–406, 1941. [Mimeographed.]

In July 1940 American holly (*Ilex opaca*) trees in New Jersey were observed by the author to be affected by a severe branch and twig die-back, which had first appeared on a single old-established tree in 1935.

One of the earliest symptoms was a wilting of the current season's growth. The affected tips were often entirely defoliated. Infection generally started at the tip of the twig and spread rapidly downwards. The newly killed twigs and leaves were black. Longitudinal sections through affected twigs showed a brown discoloration of the cortex and pith, with general breakdown of cell structure in the pith. The xylem cells were unaffected. The most conspicuous symptom was the 'flagging' of affected older branches, the browned leaves on the dead

stems standing out sharply against the foliage of neighbouring healthy limbs.

When the bark of the older stems was cut away in the diseased part, a brownish-black discoloration of the cortical tissue became apparent, often extending longitudinally to a distance of 5 or 6 in., and in advanced cases girdling the stem. Diseased material constantly showed the presence of a fungus tentatively referred by Dr. O. Reinking to *Fusarium solani* var. *martii*, not hitherto recorded as causing such a disease.

The results of inoculation experiments indicated that the fungus is capable of entering the plant directly through very young leaves, wounds in young and old stems, and perhaps through the terminal portions of unwounded stems of the current year's growth; it may possibly enter through the blossoms.

For control purposes all infected branches and fallen leaves should be removed and burnt. Pruning cuts and mechanical injuries should be treated with an antiseptic and a wound dressing.

Tucker (C. M.) & Burkholder (P. R.). **Calcium deficiency as a factor in abnormal rooting of Philodendron cuttings.**—*Phytopathology*, xxxi, 9, pp. 844–848, 2 figs., 1941.

Philodendron (?) *giganteum* cuttings placed in coarse river sand for rooting in a greenhouse in St. Louis County, Missouri, in 1939 developed foliar wilting and chlorosis, followed by necrosis, the axillary bud making little or no growth; the final stages of the disorder were characterized by a dark brown rot, starting at the lower internode and progressing upwards to the node. The roots of the affected cuttings were short (1 to 2 in.), with abnormally few branch roots, and superficially discoloured, the tips being blunt, sometimes slightly swollen and knob-like, and brown, like the older portions, while the root hairs were collapsed, brown, and obviously non-functional. The results of experiments in 1939–40 indicated that the cuttings were suffering from a lack of calcium, while an inadequate water supply may also have been concerned in the trouble.

Davis (B. H.). **A new Cercospora on Leucothöe.**—*Mycologia*, xxxiii, 5, pp. 523–525, 1 fig., 1941.

A new species, *Cercospora leucothöes*, is described as causing brown to greyish-brown circular or irregular spots, some with a narrow, black, raised border, on leaves and stems of *Leucothöe catesbaei* in nurseries and ornamental plantings in New Jersey and on Long Island.

Martin (W. J.) & Kernkamp (M. F.). **Variation in cultures of certain Grass smuts.**—*Phytopathology*, xxxi, 8, pp. 761–763, 1941.

Monosporidial isolates of *Ustilago sphaerogena* from *Echinochloa crus-galli*, *U. neglecta* [*R.A.M.*, xii, p. 617] from *Setaria lutescens*, *Sphacelotheca panici-miliacei* from *Panicum miliaceum*, and *Sorosporium cynthérismae* from *Cenchrus* sp., and single promycelial cell isolates of *U. crameri* from *Setaria italica* [ibid., xviii, p. 174] gave rise in potato dextrose and malt agar cultures at the Minnesota Agricultural Experiment Station to varying numbers of biotypes differing among

themselves in colour, topography, type of margin, consistency of colony, and growth rate and direction. In general, malt agar was more conducive to sectoring than potato dextrose except in the case of *U. crameri*. Many of the sectors were shown by their persistence on subculturing to be true variants.

HANSON (E. W.) & MILLIRON (H. E.). **The relation of the Curculionid, Anacentrinus deplanatus, to root rot and basal stem rot of Barnyard Grass, Echinochloa crusgalli.**—*Phytopathology*, xxxi, 9, pp. 832–837, 3 figs., 1941.

Echinochloa crus-galli at the Minnesota Agricultural Experiment Station was found to suffer much more extensively and severely from fungal and bacterial root and basal stem rots when infestation by the weevil *Anacentrinus deplanatus* was simultaneously present. Thus, in two lots of some 500 plants, one infested and one free from weevil attack, the percentages of fungal infection in the stem bases, roots, and insect frass of the former were 95, 68, and 100, respectively, compared with 15 and 49 per cent., respectively, for the stems and roots of the latter. *Fusarium* spp., including *F. culmorum* and *F. graminearum* [*Gibberella saubinetii*], predominated, being isolated from 69 per cent. of the stem bases and 41 per cent. of the roots of infested plants, and from 50 per cent. of the frass, while other organisms present were *Rhizoctonia* [*Corticium*] *solani*, *Helminthosporium* sp. (mostly *H. sativum*), and species of *Alternaria*, *Aspergillus*, *Basisporium*, *Brachysporium*, *Cephalothecium*, *Chaetomium*, *Penicillium*, *Stemphylium*, and *Trichoderma*, as well as at least three kinds of bacteria, all of which, together with *H. pedicellatum* [*R.A.M.*, xvi, p. 735] and a species of *Trichoderma*, were found to be attached to the exterior of the larvae, pupae, and adults of the weevil. The relative prevalence of *Helminthosporium* on the stems was considerably greater on non-infested than on infested plants (36 as compared with 7 per cent.), thereby confirming the senior writer's observations (with J. J. Christensen, *Phytopathology*, xxx, pp. 7–8, 1940) in connexion with the foot and root rots of other Gramineae, to the effect that species of this genus are more abundant on young and vigorously growing plants than on those approaching maturity or weakened by other pathogens or adverse environmental conditions.

PARRIS (G. K.) & RIPPERTON (J. C.). **Reactions of Napier Grass, Merker Grass, and their crosses to Helminthosporium eye spot.**—*Phytopathology*, xxxi, 9, p. 855, 1941.

In a paper still in the press the first-named author has described the eye spot of Napier grass [*Pennisetum purpureum*] caused by *Helminthosporium sacchari* in Hawaii and drawn attention to the resistance to the disease of Merker grass [*P.* sp.] and certain selections from the crosses Napier × Merker and reciprocals: four such selections have, in fact, been recommended as substitutes for Napier. In greenhouse inoculation experiments with spores of ten isolates of the fungus, Merker and its crosses with Napier were again shown to be resistant to, though not immune from, eye spot, which develops on the leaves and leaf sheaths in the form of diffuse, smudge-like discolorations, the

stems being seldom affected. It is clear from the data in hand that the resistance of Merker is a hereditary character, but its basis is not yet understood, though significance is attached to the thickness of the stem rind in this species as compared with Napier.

Grayson (A. R.). **Paspalum ergotism in Cattle.**—*J. Dep. Agric. Vict.*, xxxix, 9, pp. 441–442, 446, 4 figs., 1941.

During the autumn of 1941 *Paspalum dilatatum* and *P. distichum* were heavily infested in north-eastern Victoria and parts of Gippsland by *Claviceps paspali* [*R.A.M.*, xx, p. 23], which is stated to have been known in Australia only since 1935 [ibid., xv, p. 724], though reported from the United States in 1902. Continued ingestion of the diseased grasses induces in cattle nervous symptoms similar to, but generally milder than, those due to the consumption of rye infested with ergot [*C. purpurea*].

Jones (F. R.), Allison (J. L.), & Smith (W. K.). **Evidence of resistance in Alfalfa, Red Clover, and Sweet Clover to certain fungus parasites.**—*Phytopathology*, xxxi, 8, pp. 765–766, 1941.

Observations in lucerne, red clover [*Trifolium pratense*], and white sweet clover [*Melilotus alba*] nurseries at Madison, Wisconsin, in 1940, supplemented by certain information from field inspections, yielded evidence of resistance or varying susceptibility to the following fungal pathogens, ordinarily regarded as of minor importance: (*a*) lucerne, *Pseudopeziza medicaginis*, *Peronospora trifoliorum*, *Stagonospora meliloti* [*R.A.M.*, xviii, p. 320], and *Stemphylium botryosum* [*Pleospora herbarum*: ibid., xx, p. 306] (which affected Cossack and Grimm significantly less than Ladak); (*b*) red clover, *Erysiphe polygoni*, *S. sarciniforme* [ibid., xx, p. 582], *Uromyces trifolii fallens* [*U. fallens*: ibid., xix, p. 161], and *Cymadothea* [or *Dothidella*] *trifolii* [ibid., xiv, p. 367]; and (*c*) sweet clover, *Pseudopeziza meliloti* and *Stagonospora meliloti*.

Piland (J. R.) & Ireland (C. F.). **Application of borax produces seed set in Alfalfa.**—*J. Amer. Soc. Agron.*, xxxiii, 10, pp. 938–939, 1 fig., 1941.

A lucerne planting on Cecil fine sandy loam soil in North Carolina, with a P_H of 6·6 and an available boron content of 0·19 p.p.m., showed severe boron deficiency symptoms (yellowing) [*R.A.M.*, xx, p. 306] in 1940. In the section of the field receiving a 20 lb. application of borax in the late winter of 1941 the plants made a good set of seed, whereas none was obtained from those in the untreated part. The untreated hay was found to contain 4·80 p.p.m. boron and the treated 14·40, while the amounts of the element in the top and subsoils were increased from 0·19 to 0·21 and 0·18 to 0·25 p.p.m., respectively, by the 20 lb. application. It is thought that the long-standing failure to maintain satisfactory stands of lucerne in the State are at any rate partially due to boron deficiency.

Powers (W. L.). **Boron—a minor plant nutrient of major importance.**—*Bett. Crops*, xxv, 6, pp. 17–19, 36, 3 figs., 1941.

Following a brief survey of previous investigations on the value of

boron as a remedy for various deficiency diseases of agricultural crops, the writer gives details of 36 trials conducted from 1937 to 1940 on 24 crops and 20 soil types in Oregon. A single application of 40 lb. boric acid per acre on Willamette loam produced a lucerne yield of 4·88 tons, compared with 2·83 tons in the control plot, coupled with absence of yellow top [see preceding abstract] for 3½ years; the net profit in this instance was computed at $14.40 per acre. In other tests the lucerne yields were augmented by increasing rates of borax applications up to 60 lb. per acre, a 30 lb. dose being probably safe for most purposes. It is estimated that there are now some 50,000 acres of lucerne in the Willamette Valley capable of yielding ½ to 1 ton more per acre if treated with borax at the rate of 30 lb. per acre, costing about $1 per acre. The losses due to beet canker [*R.A.M.*, xviii, p. 817] (which is commercially, but not completely, controllable by borax treatment at the standard rate), and cracked stem of celery [ibid., xx, p. 192] are estimated at 8 to 10 and up to 50 per cent. of the crops, respectively.

Harris (M. R.). **Rosellinia root rot of Alfalfa in California.**—*Plant Dis. Reptr*, xxv, 15, p. 407, 1941. [Mimeographed.]

During January, 1941, a lucerne field near Banning, California, showed circular areas within which every plant had been killed by *Rosellinia necatrix*. The fungus appeared to have been spread by cultivation from a single original infection. It had not previously been reported within 300 miles of the locality, or on lucerne in the United States.

Herbst (W.). **Zum Stande unserer Erkenntnis über die Biologie des Fusikladiums.** [On the status of our knowledge concerning the biology of the *Fusicladium*.]—*Forschungsdienst*, xi, 5, pp. 553–565, 1941.

The writer discusses the available information on the biology of apple scab (*Venturia inaequalis*) under the following headings: (1) economic, politico-nutritional, and socio-biological significance of the disease in Germany and the need for intensive control measures; (2) study of the life-cycle and biology of the causal organism; (3) investigations of the biological foundations for scab infection in the hosts of the fungus; (4) researches on the course of the parasitic relationship between the fungus and its host, including the connexion with environmental (especially meteorological) factors; and (5) methods of intensive control applicable in Germany. Much of the information presented here has already been noticed from other sources [cf. *R.A.M.*, xvi, p. 618; xviii, pp. 37, 531, *et passim*], but among other points of interest may be mentioned the importance attached to the socio-political repercussions of the enormous annual losses from the disease, conservatively estimated (for the apple harvest alone) at RM. 40,000,000; and the distribution of physiologic races of *V. inaequalis* from the north-west to the south-east.

Stoy (O.). **En mindre bekant sjukdom på Äppelträd.** [A lesser known disease of Apple trees.]—*Fruktodlaren, 1940*, 4, pp. 132–134, 4 figs., 1940.

A large number of apple trees in two localities of Malmöhus, Sweden,

were observed in the early summer of 1940 to bear cankers which were identified by the Plant Protection Institute, Stockholm, as caused by *Nectria galligena*, a relatively unfamiliar pathogen in Sweden.

WORMALD (H.). **Notes on plant diseases in 1940.**—*Rep. E. Malling Res. Sta., 1940*, pp. 55–58, 1941.

These notes [cf. *R.A.M.*, xix, p. 690] contain the following items of interest. Dwarf lateral scorch of raspberries [ibid., xx, p. 72] was not present at East Malling during 1940, and no inquiries were received about it, though a year before it had been very severe. The evidence obtained confirmed the view that the trouble is induced by high temperatures in mild winters.

Spores of the *Fusarium* stage of *Nectria galligena* [loc. cit.] collected from apple cankers after a frosty period when temperatures dropped as low as 12° F. germinated within 24 hours at ordinary room temperature.

Stereum purpureum was frequently found in association with 'papery bark' of apple trees [loc. cit.]. Apple stems left lying about after the trees have been dug up owing to papery bark serve as a source of infection; they should be burnt immediately. Infection by *S. purpureum* frequently causes failure in top-grafting, and frame-working is recommended instead.

Early in 1941 dead spurs of Conference pear were observed bearing pustules of *Monilia cinerea* [*Sclerotinia laxa*: ibid., x, p. 322] on the axis of the spur and the dead flower stalks, the remains of which had persisted, indicating that blossom wilt had occurred in the spring of 1940. The disease is unusual in pears, and has not before been observed on the Conference variety. A single pear shoot was affected by powdery mildew (*Podosphaera leucotricha*) in a garden at Maidstone.

Further observations have demonstrated that the angular leaf spot of apples previously reported from southern England [ibid., xix, p. 711; xx, p. 193] was caused by a froghopper [*Cercopis sanguinea*], the fungi found being saprophytic.

A wilting of the shoots in the layer rows of plum and cherry varieties used as root-stocks killed about 40 per cent. of the shoots in the Brompton plum variety, and over 50 per cent. in St. Julian A. The disease is attributed to a species of *Cylindrocladium*. Cherries from Surrey showed a similar wilt and yielded the same fungus, which was also isolated from wilted lupins.

Early in July gooseberry leaves showed severe spotting and were turning yellow. Lesions bearing conidia of *Pseudopeziza ribis* were found on the leaf stalks and fruit. A few spots on the fruit bore conidia, and others, which were small and dark and had ill-defined margins, with a raised spot in the centre, appeared to represent the early stage of fruit infection.

In August shoots of *Ribes fasciculatum chinense* were found bearing mycelium of *Sphaerotheca mors-uvae*.

A row of young walnut trees of selected English varieties showed the presence of *Pseudomonas* [*Xanthomonas*] *juglandis* [ibid., xx, p. 237]. The only tree with any appreciable crop belonged to the Patching variety, and even on this about 50 per cent. of the fruits were affected.

HARRIS (R. V.) & WORMALD (H.). **Plant pathology, mycology, and bacteriology.**—*Rep. E. Malling Res. Sta., 1940*, pp. 23–25, 1941.

This report of research work at East Malling during 1940 [cf. *R.A.M.*, xix, p. 716] contains, *inter alia*, the following items of interest. Very few further cankers (*Pseudomonas mors-prunorum*) [ibid., xix, p. 717] were recorded in 1940 on Victoria plums worked on stems of other varieties. The evidence indicates that plum bacterial canker can be controlled by using trees with resistant stems, Purple Pershore and Myrobolan B providing the most successful stems so far. Measurements of cankers on plums experimentally inoculated in 1939 proved that the stems of Pershore, Denniston's Gage, and Victoria are very highly susceptible, those of President, Utility, Warwickshire Drooper, and Purple Egg intermediate, and those of Myrobolan B resistant, seldom developing any cankers.

Further work on raspberry mosaic [ibid., xix, p. 716; xx, p. 69] confirmed the widespread infection of the Lloyd George variety with a severe form of mosaic 2. The newly introduced Preussen cane was found to approximate closely to the symptomless-carrier reaction of Lloyd George, though it sometimes shows leaf symptoms. Burnet Holm and Pyne's Royal canes were shown to be entirely permeated with virus with indistinct and intermittent symptom expression, while cane of a selected clone of Norfolk Giant proved to be free from virus.

WORMALD (H.) & MONTGOMERY (H. B. S.). **Bacterial blossom blight of Pear trees.**—*Rep. E. Malling Res. Sta.*, 1940, pp. 58–59, 1941.

Pear trees in Kent and Essex are frequently affected by a blackening and wilting of the flowers of a truss, the discoloration extending into the stalk of the cluster of flowers and sometimes into the older parts of the spur. Frequently a flower bud and its surrounding scale leaves turn black soon after the bud begins to swell, and the flowers either do not open or expand irregularly and imperfectly.

Isolations from affected material in most cases showed the presence of an organism apparently closely related to, if not identical with, *Pseudomonas prunicola*. Inoculations of pear flower trusses with pure cultures of this organism resulted in complete blackening and withering of the flower clusters.

The condition has been observed on most varieties of pears cultivated in England; locally, Durondeau and Pitmaston are most often affected, but in some years Catillac is also seriously attacked. Specimens of a similar disease were received from Jersey, but the associated organism was different. Some 30 years ago a similar disease was reported from the west of England, and was associated with *Bacillus barkeri* [*R.A.M.*, iv, p. 469]. The behaviour of this organism in culture differs from that of *P. prunicola*, and they are considered to be distinct species. In experiments at East Malling another organism also gave successful results in inoculation experiments, so that, apparently, the symptoms may be caused by more than one species of bacteria. A bacterium resembling that obtained from the flowers and spurs was also isolated from leaf and fruit spots.

Soon after the buds expand in the spring, infection develops, and it is thought that the organism overwinters in or on the buds, which probably become infected from spurs attacked the previous year. All affected spurs should therefore be cut out directly they become noticeable, as they constitute a possible source of infection both for the current year's leaves and fruits and for the next year's buds.

Eaton (F. M.), McCallum (R. D.), & Mayhugh (M. S.). **Quality of irrigation waters of the Hollister area of California with special reference to boron content and its effect on Apricots and Prunes.** —*Tech. Bull. U.S. Dep. Agric.* 746, 59 pp., 5 pl., 3 maps, 1941.

In connexion with their fully tabulated analytical studies on the quality of the irrigation waters of the Hollister area of California, constituting the upper portion of the Santa Clara Valley in San Benito County, the writers describe the symptoms developing in apricots, prunes, and other plants as a result of excessive concentrations of boron (upwards of 0·3 p.p.m. in the case of the sensitive group, comprising stone and citrus fruits, avocado, persimmon, grapes, apples, pears, Kadota fig, thornless blackberry, pecans, American elm, English and black walnuts, and Navy beans [*Phaseolus vulgaris*]). Injury to the leaves of stone fruits is manifested by spots or longitudinal strips of brown, corky tissue along the petioles and midribs, representing the sloughing-off of scales as a result of the death of underlying tissue and the formation of cork parenchyma. Thickening of the bark of the trunk and twigs of apricots is sometimes observed, while shortening of the internodes may occur. The twigs of affected trees are abnormally stiff, and readily break transversely on bending. In apricots the first symptom on new growth is a die-back of the shoot tips, following the breakdown of the bark in the terminal region, while nodular enlargement of the first- and second-year twigs is a common but not invariable feature. The fruit of severely diseased trees is often undersized with necrotic areas in the epidermis and underlying flesh, while discoloration and more or less extensive shrinking may also be present. In one case the flesh of badly damaged apricot fruit was found to contain 732 p.p.m. boron on the basis of dry weight. Imperial prunes, which are more sensitive than those of the Sugar variety, exhibit symptoms resembling those of apricots, whereas in Sugar prunes and peaches the breakdown of the bark usually starts immediately above the nodes. Thickening of the foliage, corkiness of the midribs and petioles, enlarged nodes, death of the shoot tips, and gumming are all typical features of boron injury in French prunes. A conspicuous symptom of the trouble in peaches is the breakdown of the cortical tissues of the young twigs, generally initiated just above the leaf axils, whence it extends and commonly encircles the twig. Poor development, insipidity, and discoloration of the fruit are common to both peaches and apricots, while the former also show splitting of the pits, which is, however, not exclusively associated with boron toxicity.

Walnuts, vines, and other plants suffering from excess accumulations of boron develop foliar chlorosis beginning at the margins, followed by necrosis and the death of the affected tissues.

Bucksteeg (W.). **Untersuchungen über die Wirkung von Kältegraden auf Keim- und Infektionsfähigkeit der Konidien von Sclerotinia cinerea Schroet. und Sclerotinia fructigena Schroet.** [Studies on the effect of low temperatures on the germinability and infection capacity of the conidia of *Sclerotinia cinerea* Schroet. and *Sclerotinia fructigena* Schroet.]—*Z. PflKrankh.*, l, pp. 507–512, 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, ciii, 21–24, p. 413, 1941.]

When apples, plums, and cherries inoculated with *Sclerotinia cinerea* [*S. laxa*] and *S. fructigena* [*R.A.M.*, xviii, p. 534] were stored at varying degrees of cold, the conidia were found to be germinable and capable of infection after six months' exposure to a temperature of −14° to −18° C., though their virulence, as judged by the rapidity of the attack on inoculated apples, gradually declined under these conditions. No germinable conidia were found after ten weeks on diseased fruits overwintering in the open.

Huber (G. A.) & Baur (K.). **Brown rot on stone fruits in Western Washington.**—*Phytopathology*, xxxi, 8, pp. 718–731, 5 figs., 1941.

Brown rot of stone fruits (*Sclerotinia fructicola* and *S. laxa*) was particularly severe in Western Washington in 1936, when it caused reductions of yield of 60, 40, and 90 per cent. in Italian prunes and sour (Montmorency, English Morello, and Early Richmond) and sweet cherries, respectively. The fungi were isolated on acidulated potato dextrose agar from blossoms, fruits, 'shedders' (half-grown fruits ceasing to develop further), cankers, twigs, or mummies of these hosts, peach, and apricot, while an unidentified organism, S.C. No. 1, was isolated from prune 'shedders', mature fruits, and twigs with adhering mummies.

Inoculation experiments were conducted with *S. fructicola* and *S. laxa* on the blossoms, twigs, and fruits of all four kinds of fruit, of which apricot, cherry, and peach contracted blossom blight on infection with both species, whereas in the case of Italian prune the floral parts became diseased but the pedicels were not involved. *S. laxa* caused definite twig cankers on apricot, cherry, and peach, but not on prune, while *S. fructicola* gave negative results in this respect. Both species induced decay in apricot, cherry, peach, and prune fruits. The sporodochia of *S. laxa* were found on cankers, blighted twigs and fruit spurs, and mummies overwintering on apricot, cherry, and peach trees, and on prune mummies and blighted twigs, the former also bearing an abundance of apothecia of *S. fructicola*.

Blodgett (E. C.). **Studies on Peach viroses in Idaho.**—Abs. in *Phytopathology*, xxxi, 9, pp. 859–860, 1940.

The outstanding symptom of a peach disease reported from Idaho in 1938 and termed 'wart' is the development of verrucose excrescences on the fruits, especially near the stylar end. The insertion of buds from affected trees into healthy stocks results in the formation of warts on the fruits of the latter. Studies on the host range of the disease and its occurrence in two forms, one known as 'smooth' and the other as 'crease wart' are in progress. Peach mottle, recognized in the State

since 1939, and regarded as distinct from mosaic, is readily transmissible from diseased to healthy trees, while buds from mottled peach trees placed on sound Bing cherry induce symptoms resembling those of mottle leaf of the latter host, and Montmorency cherries similarly treated develop severe die-back of the current growth. Another common disorder of Idaho peaches involving foliar chlorosis, usually accompanied by necrosis and ending in defoliation, appears to be similar to the X disease [*R.A.M.*, xx, p. 540].

Stoddard (E. M.). **A new host for the X-disease virus.**—*Plant Dis. Reptr*, xxv, 13, p. 361, 1941. [Mimeographed.]

X disease of peaches [*R.A.M.*, xx, p. 346] has been transmitted to *Prunus besseyi* by budding. The symptoms were expressed in dwarfing of the growth and yellowing of the foliage. Plants of *P. hortulana* budded with diseased peach buds showed no symptoms, but the shoots growing from the diseased buds developed characteristic signs of the disease. This suggests that *P. hortulana* is either immune or is a symptomless carrier, and experiments to settle this point are in progress.

Woodhead (C. E.) & Chamberlain (E. E.). **Report on a survey of small-fruit culture in New Zealand, November–December, 1939.**—*Orchard., N.Z.*, xiii, pp. 110–117, 139–141, 1940.

This report includes the following information on diseases. Strawberry root rot of obscure origin has necessitated the virtual abandonment of the industry in Hawke's Bay, Wanganui, and Wairarapa, and causes heavy losses, frequently involving over 50 per cent. of the crop, in Auckland, the sole remaining district in North Island in which commercial cultivation is still practised. The acreage of strawberries planted at Christchurch has been much reduced, while severe damage has likewise been reported from Waimate and parts of Central Otago. Recent work indicates that a fungus may be the agent of the trouble.

Yellow edge [*R.A.M.*, xix, p. 644] probably comes next in importance to root rot, and may be equally injurious in Auckland, where the prolific but highly susceptible Marguerite variety has had to give place during the last eight years to the comparatively resistant but much less productive Captain Cook. Over 70 per cent. infection has been shown by certain lines of Marguerite, with a corresponding loss of crop of 50 per cent. Royal Sovereign is another very susceptible variety, while Laxton's Noble, like Captain Cook, may show moderately high percentages of infection. Madame Melba and some locally produced seedling varieties appear to be free from yellow edge. One healthy line of Royal Sovereign was found in Central Otago. An attempt is in progress to raise clean lines of Marguerite, Captain Cook, Royal Sovereign, and other standard varieties. Crinkle has not yet been definitely recorded in New Zealand, but is suspected in various districts. Leaf spot (*Mycosphaerella fragariae*) is prevalent throughout the Dominion, causing appreciable damage in Auckland unless regular spraying with Bordeaux is practised.

Cane wilt (*Leptosphaeria coniothyrium*) [loc. cit.] is the most destructive disease of raspberries, but here again a routine schedule of Bordeaux mixture gives satisfactory control. Some plantings were so

heavily infected that very little fruit was produced. *Armillaria mellea*, though not widespread, may cause heavy sporadic losses in the raspberry crop, especially in the Greytown and Christchurch areas. The spread of the fungus may be arrested by isolating the affected plantings and rotation with a non-susceptible crop. Silver leaf (*Stereum purpureum*) has been observed on raspberries in several districts, the incidence of infection being only moderate but the symptoms very severe, the diseased canes either dying or becoming too weak to bear fruit. *Plectodiscella veneta* is widespread but generally unimportant in the Motueka-Riwaka district; this is the first report of the fungus from New Zealand. Crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) appears to be fairly prevalent, and observations in the Island Block region of Otago indicate that it definitely weakens its host. Suspected cases of raspberry mosaic are under investigation. A disorder involving the almost complete absence of edible raspberry fruit appears to be of physiological origin.

S. purpureum is the most virulent pathogen of currants and gooseberries, especially the latter, beds of which normally remaining in full production for 25 or 30 years and upwards often have to be replaced after ten or twelve on account of the disease, notably in the Greytown district, where an incidence of over 50 per cent. infection is not infrequent. *M. grossulariae* is also prevalent on both hosts, particularly at Greytown, and treatment with Bordeaux mixture is often necessary. *Verticillium albo-atrum* was recently observed on gooseberries in a nursery bed at Greytown. Steps should be taken to prevent the further dissemination of this very troublesome disease by avoiding material from contaminated sites. Bronze-coloured excrescences on gooseberry leaves and the associated failure of fruit bud development have caused fairly heavy losses during the last two or three years, especially in young beds. Physiological factors or an Eriophyid mite may be implicated.

Snell (W. H.). **Blister rust studies of three patches of Red Currants in New York.**—*Phytopathology*, xxxi, 8, pp. 732–740, 1 graph, 1941.

This is a progress report on investigations proceeding in the Adirondacks, New York, concerning the part played by red currants in the dissemination of white pine blister rust (*Cronartium ribicola*) and the wisdom or otherwise of a policy of wholesale eradication of the alternate host from the vicinity (a radius of 900 ft.) of plantings of the trees.

Compared with black currants, or even wild gooseberries, red currants are relatively resistant to blister rust [*R.A.M.*, xx, p. 504], and consequently more open to the influence of the various factors limiting production of the sporidial inoculum. The analysis in 1940 of three patches of red currants showed that only one or two bushes in a row of six or twelve are very slightly, if at all, infected; that the diseased leaves tend to begin falling early (in one case before the end of July), with the result that the defoliation of this species is complete before that of black currants and wild gooseberries. In two lots of neglected red currants on abandoned farms, 75 to 96 per cent. of the infection spots had become necrotic before the end of July, prior to the

production of teleuto- or even of uredosori. One bush bore only 6,468 teleutosori (41 instead of the 2,400 per sq. in. to be expected under optimum conditions). Moreover, 95 per cent. of the teleutosori on these bushes were only 22 to 50 per cent. the normal length for *Ribes sativum* of 800 to 1,360 μ, and most of these were apparently dead. On the bushes of the same two patches the dead infection spots were 0·0112 sq. in. in area, while the newly formed living ones averaged only 0·0036 sq. in., some being so minute as to accommodate only a single uredosorus.

Östlind (N.). **Virussjukdomar hos Jordgubbar.** [Virus diseases of Strawberries.]—*Fruktodlaren, 1940*, 3, pp. 89–91, 2 figs., 1940.

In this account of strawberry yellow edge and crinkle, investigated by the writer on a visit to England, it is stated that the former [*R.A.M.*, xx, p. 72] has been observed on the Royal Sovereign variety in Sweden.

Zeller (S. M.) & Weaver (L. E.). **Stunt disease of Strawberry.**—*Phytopathology*, xxxi, 9, pp. 849–851, 1 fig., 1941.

'Stunt' of strawberries, recognized in the Pacific North-west for a number of years, was doubtless confused with yellows (xanthosis) in western Oregon and Washington as early as 1925 [*R.A.M.*, xi, p. 497]. The disease is most severe under the cool, humid conditions prevailing along the coast or a short distance inland, the Marshall variety expressing its characteristic symptoms in a particularly well-defined manner. In addition to the pronounced dwarfing of the affected clones, which are two or three times shorter than healthy ones, the under sides of the leaves show a dull grey tone, similar to that imparted by mildew [*Sphaerotheca humuli*], but otherwise there is surprisingly little reduction of chlorophyll. The growth habit of stunted plants is moderately erect in contrast to the flatness of those suffering from xanthosis or severe crinkle. The leaves are erect and folded along each midvein, which may be somewhat tortuous, until the full length of the petiole is attained, whereupon they open out to expose a flat, dull upper surface. The stunted leaflets may be cupped, especially in some of the thick, dark-leaved varieties, but more often the margins turn downwards; at maturity they make a rattling, papery sound on brushing by hand. The fruit from diseased plants is small, and usually seedy and hard. The disturbance would appear to be more closely related to witches' broom [ibid., xviii, p. 402] than to any other strawberry virus.

'Stunt' is readily transmissible from diseased Marshall plants and U.S.D.A. seedlings to healthy Marshalls by means of the aphid *Capitophorus fragaefolii*. In one instance evidence was forthcoming of dual infection by stunt and crinkle in the William Belt variety, the latter condition being completely masked while the symptoms of the former were atypical.

'Stunt' is proposed as the common name for the disease under investigation, which is scientifically designated *Fragaria* virus 5, or to adopt the Holmes system of virus classification [ibid., xix, p. 229], *Nanus cupuliformans*.

Tims (E. C.). **A new leaf spot of Fig.**—Abs. in *Phytopathology*, xxxi, 8, p. 771, 1941.

A single fig tree of the Celeste variety near Houma, Louisiana, was attacked in the late summers of 1939 and 1940 by a fungus tentatively identified as *Cephalosporium acremonium*, which produces on the foliage light brown, darker-bordered spots, irregularly concentrically zonate on the upper surface and bearing on the lower one numerous small, white, cushion-like fruiting bodies of the pathogen. The centres of the larger lesions (4 to 5 cm. in diameter) often fall out, imparting a very ragged aspect to the leaves. Inoculation experiments with the causal organism under warm, humid conditions resulted in the development of rapidly expanding spots. Wounds do not appear to be necessary for the establishment of leaf infection. Severe damage from the new disease is not anticipated, owing to its late development after the ripening of the bulk of the fruit.

Magee (C. J.). **Control of squirter and black-end diseases of Bananas.**—*Banana Bull., Sydney*, i, 60, p. 4, 1941.

In connexion with recommendations for the control of banana squirter (*Nigrospora sphaerica*) and black end (*N. sphaerica*, *Gloeosporium musarum*, and *Fusarium* spp.) by dipping the fruit in a salicylanilide solution after packing, the writer mentions that, in addition to shirlan AG and shirlan WS [*R.A.M.*, xix, p. 106], a third preparation is now available on the market known as shirlan flakes, in which sodium salicylanilide is combined with a wetting agent. In dipping the fruit, care should be taken to dislodge airlocks in papered cases by raising and lowering the case a few times by means of a loop or rope or a pulley block and tackle. Suitable dimensions for a vat for this purpose are 15 in. deep, 13½ in. and 17½ in. wide at the ends and middle, respectively, and 32 in. long. The duration of the dip need not exceed ½ minute, and the treatment should constitute a routine procedure from May to November, especially for fruit destined for the Adelaide or Melbourne markets.

Hopkins (J. C. F.). **Diseases of fruit, flowers, and vegetables in Southern Rhodesia. 4, Mildew of Mangoes.**—*Rhod. agric. J.*, xxxviii, 9, pp. 470–471, 1941.

Substantial losses of yield are caused to mango growers in Southern Rhodesia as a result of blossom infection by mildew (*Oidium* sp.) [*?O. mangiferae*: *R.A.M.*, xx, p. 413], which is frequently overlooked until it is too late to apply remedial measures. The flowers may fail to open and may drop before being fertilized, or the young fruits may reach the size of a pea and then fall. In the more humid parts of the Colony, especially on the eastern border, the fungus may develop abundantly on the new leaves. Infection occurs every year, severity depending chiefly on climatic conditions. Control consists in the application of fine sulphur dusts when the flower clusters have expanded (just before the flowers open), immediately after petal fall, and when the young fruits are the size of buckshot. Wet spraying with colloidal sulphur (1 lb. per 30 gals. water) also gives satisfactory results.

Wilson (J. D.) & Vogel (M. A.). **Density and flowability of insecticidal and fungicidal dusts and dust ingredients.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xxvi, 209, pp. 69–79, 1941.

In preliminary studies at the Ohio Agricultural Experiment Station the copper content (stated as the metallic equivalent) of a number of fixed copper compounds [*R.A.M.*, xx, p. 2] tested for their degrees of density and 'flowability' (defined as the rate of passage of a compound or mixture through the feed aperture of a dusting apparatus, the Peerless hand duster in this case) ranged from 86 per cent. for cuprocide GA (Röhm and Haas Co.) to 23 per cent. for copper oxalate (Harshaw Chemical Co.). Density (expressed as gm. per cu. in. and determined by means of a Scott volumeter) varied between 16 for cuprocide GA and 2·67 for copper oxychloride sulphate (Harshaw); this property is not exclusively a function of size, since yellow cuprocide, with extremely minute particles, has a density of 11·5 gm. 'Flowability' under a standard set of conditions ranged from 2·10 lb. per minute for cupro-K (Röhm and Haas) to 0·49 lb. for coposil (California Spray Chemical Co.). When the different compounds were mixed with Avondale wheat flour (Kroger Baking Co.) and EM 23 talc (Eastern Magnesia Talc Co.), the densities of the mixtures varied only from 7·22 for that containing cuprocide GA to 6·22 for the one made up with coposil, whereas the use of flour and EM 42 talc involved variations of up to 200 per cent., ranging from 1·87 lb. with cuprocide GA to 0·84 lb. with coposil.

Among the diluents included in the experiments, the density of the talcs ranged from 2·70 gm. for EM 29 to 9·68 for EM 42, while that of the clays varied only within narrow limits—4·26 gm. for Tower and 5·45 for Cherokee (both United Clay Mines Corporation). The gypsums and whitings are comparatively heavy (6·53 to 10·58 gm.) unless ground to excessively fine particle size. The least dense of the common diluent materials were diatomaceous (infusorial) earth and its variants, dicalite and celite (Chemical Rubber Co., Dicalite Co., and Johns-Manville Co., respectively), with densities of 2·43, 1·48, and 1·43 gm., respectively. Of the adhesives used in the tests, the density of the bentonites ranged from 4·61 for micronized to 10·25 for Wyobard (both Wyodak Chemical Co.) and that of the wheat flours from 3·81 for a soft blend to 5·45 for Family Circle (both Pilsbury Flour Mills Co.), while that of the one sample of soy-bean flour (duspray soya, Central Soya Co.) was 6·21. The diluents influence the density and 'flowability' of the mixed dust formulas more than do the copper compounds, being used in larger proportions. When the proportions of light and heavy diluents were varied in a single formula to yield mixtures of different densities and rates of flow, density was found to decrease steadily and fairly uniformly with each increase in the lighter diluent, whereas 'flowability' underwent little change provided the amount of low-density diluent was not less than 20 per cent. of the total mixture.

Proprietary dust mixtures available on the market varied in density between 9·80 and 4·88 gm. per cu. in., and in 'flowability' from 2·70 to 0·80 lb. per minute.

Stationary spray plant.—*Fruit World, Melbourne*, xlii, 8, p. 11, 1 fig., 1941.

The owners of a 40-acre orchard of 31-year-old pear trees in Victoria

report that after three years' continuous service their stationary spray installation [cf. *R.A.M.*, xix, p. 295; xx, p. 265] has proved completely satisfactory. Using 1 pump and 7 men it covers the whole area in 7 days, as against 16 days required for a portable plant using 4 pumps and 8 men. One great advantage is that it permits spraying to be interrupted or resumed immediately, as required. The cost of installation amounts to approximately £13 per acre.

McLean (R. C.) & Cook (W. R. I.). **Plant science formulae. A reference book for plant science laboratories (including bacteriology).**—viii+203 pp., London, Macmillan & Co., 1941. 7*s.* 6*d.*

This book contains much information useful to the laboratory worker. The formulae are of proved and established worth, and include a number for special fixing and preserving solutions, stains, solid and liquid culture media.

Hamly (D. H.). **A precision fine adjustment for standard microscopes.**—*Science*, N.S., xciv, 2437, pp. 263–264, 1941.

The author describes an attachment for use with a standard microscope making it possible to obtain a series of photomicrographs showing all the changes in appearance produced by progressive refocusing.

Ehrlich (J.). **Storage and mounting of demonstration specimens.**—*Phytopathology*, xxxi, 8, pp. 763–766, 1 diag., 1941.

Full details are given of the construction of a cabinet accommodating a series of wooden drawers of four sizes, which has been specially devised for the storage of large, heavy, or fragile demonstration specimens in the pathological laboratory of the School of Forestry, Moscow, Idaho.

Edson (H. A.) & Wood (Jessie I.). **Crop losses from plant diseases in the United States in 1939.**—*Plant Dis. Reptr, Suppl.* 127, pp. 178–209, 1940 (issued June, 1941).

The estimated reductions from fungal, bacterial, virus, and other diseases of fruit, vegetable, cereal, tomato, and tobacco crops in the United States in 1939 are presented in tabular form [cf. *R.A.M.*, xix, p. 357].

Dodd (A. P.). **The biological campaign against Prickly-Pear.**—ii+117 pp., 37 pl. (1 col.), 6 graphs, 1 map (col.), Brisbane, Commonwealth Prickly Pear Board, 1940.

This striking record of the successful campaign waged against prickly pears (*Opuntia* spp., chiefly *O. inermis* and *O. stricta*) in Australia by the Commonwealth Prickly Pear Board from 1920 to 1940 [cf. *R.A.M.*, v, p. 303] contains the following items of mycological interest.

The anthracnose fungi *Gloeosporium lunatum* [ibid., xviii, p. 810] and *Phyllosticta concava* [ibid., xvii, p. 461] are established in Australia, but *Montagnella opuntiarum* [ibid., v, p. 303] has not been found. *G. lunatum* occurred in 1925–6 in several widely separated areas, where it had probably become established some years before. Locally, the circular lesion character is seldom found. As a primary parasite the

fungus occurs chiefly in nitrogen-deficient plants known as 'yellow pear', being often active round the entrance holes of newly hatched larvae of *Cactoblastis cactorum*, the chief agent of control. In many instances it is associated with these larvae as a wound organism in the rapid decay of succulent segments, the decay set up taking the form of a soft rot.

The most conspicuous anthracnose is that due to *P. concava*. First found in 1929, the fungus occurs over the whole of the prickly pear territory, from Mackay to the Hunter River. The disease begins in May or June, reaches a peak in July and August, and ceases in September or October. Save in central Queensland, where the fungus is very active each season, destroying many segments, and the northern pear areas of the same State, occurrence is not general, but confined to local outbreaks in situations favouring attack. At the close of winter damage is marked but transitory, as fungal activity ceases as the weather grows warmer, and new growth takes place. Very occasionally, young plants in shaded situations have been destroyed by the fungus. Lesions due to *P. concava* have been observed on *O. aurantiaca* and very rarely on *O. tomentosa*.

Locally, bacterial soft rot or rots accompany the activities of *C. cactorum* in the upper segments of the host. Complete disintegration is not induced by bacterial activity, except in the case of young plants. The organism is carried on the skin of the larvae, and spreads from one segment to another only if carried by the insects. The disease takes the form of a liquid putrefaction of the pads. Activity occurs when the larvae are feeding vigorously, but even at these times bacterial soft rots require favourable weather conditions before they develop.

From 1929 to 1931 the winter generations of *C. cactorum* attacking primary pear in Queensland and New South Wales suffered severe losses as a result of epidemic attacks by bacteria and a species of *Beauveria*. At least seven bacterial organisms found were able to cause the death of the insect when inoculated into the blood stream, though the losses appeared mainly due to two species of *Coccobacillus* and one *Streptococcus*. The *Beauveria* fungus destroyed individual larvae and entire colonies, as many as 200 dead, infected larvae being found in one segment. The fungus did not occur in epidemic form over large areas, except in one instance, in which it appeared to be the principal cause of a heavy death rate among a concentrated population over an area of several square miles. It was transmitted to healthy larvae by feeding them on prickly pear contaminated by the spores, fatal results ensuing within seven days. Evidence was obtained that two factors are essential before organisms pathogenic to the insects can become important, viz., the larvae must be crowded, and their food supply unsuitable. Since 1933 there has been no record of bacterial disease on *Cactoblastis*, and only one of *Beauveria*, which occurred in a small area in July, 1938.

Plotho (O. v.). **Die Synthese der Knöllchen an den Wurzeln der Erle.** [Nodule synthesis on Alder roots.]—*Arch. Mikrobiol.*, xii, 1, pp. 1–18, 4 figs., 1941.

At the Microbiological Institute, Göttingen, the causal organism,

Actinomyces alni, of the root excrescences on alder (*Alnus incana*) [*R.A.M.*, xviii, p. 335] was isolated on various media, of which the most suitable proved to be a meat extract-peptone agar, and inoculated with positive results into *A. glutinosa* plants germinated under sterile conditions and grown in a nutrient solution devoid of nitrogen except for the traces contained in the tap water used to prepare the *Actinomyces* spore suspension. Well-developed plants were found in September 1940, i.e., 15 months after inoculation, to have assimilated from the atmosphere 63·44 mg. nitrogen, obviously fixed by the symbiont, the nitrogen content of the shoots and leaves being 45·22 mg. and that of the roots and nodules 22·06 mg. The abundant deposits of carbohydrates in the nodules and adjacent root cells are believed to be connected with nitrogen assimilation. Bacteroids were not observed, the spread of the endophyte being effected by progressive development in the root cells of the host.

STEINBERG (R. A.). **Sulfur and trace-element nutrition of Aspergillus niger.**—*J. agric. Res.*, lxiii, 2, pp. 109–127, 1941.

This is a detailed study on the sulphur metabolism of *Aspergillus niger*, in the course of which it is shown that alterations in the source of sulphur supply remain practically without effect on the trace element requirements of this fungus.

KENT (N. L.). **The influence of lithium salts on certain cultivated plants and their parasitic diseases.**—*Ann. appl. Biol.*, xxviii, 3, pp. 189–209, 3 graphs, 1941.

In greenhouse experiments at Cambridge on the effect of lithium on the susceptibility of plants to disease [cf. *R.A.M.*, vi, p. 628; ix, p. 100; xiii, p. 459], the incidence of leaf spot caused by *Septoria apii* on celery was reduced by lithium chloride and nitrate at concentrations between 1 and 4 mg.-equiv. Li/l. soil applied to the surface of the soil and the weight of the host plants was increased, the intensity of disease on plants 36 days after treatment with 4·8 mg.-equiv. LiCl/l. soil being as follows: on the cotyledons 57 per cent., primary disease on the leaves 40 per cent., and secondary disease 1·4 per cent. of that on the controls; larger concentrations, though more effective, were toxic to plant tissue. The lithium content of the plant was increased following the application of lithium to the soil. A high inverse correlation was found to exist between the concentration of lithium in the celery leaves and the amount of disease present.

The susceptibility of wheat seedlings to powdery mildew (*Erysiphe graminis*) was generally reduced by lithium chloride and nitrate, the addition of 18·35 mg. Li/l. soil as chloride reducing the relative disease intensity from 100 in the controls to 15; small doses had a stimulating and large doses a retarding effect upon the growth of the seedlings. All the concentrations tested increased the lithium content of the plant tops. Significant inverse correlations were found to exist between relative mildew intensity and both the lithium supply in the soil and the concentration of lithium in the fresh plant material.

The susceptibility of young wheat plants to brown rust, *Puccinia triticina*, was significantly reduced by lithium chloride applications at

the rate of 18 mg.-equiv./l. soil, a concentration which was distinctly toxic to the plants, reducing their dry-weight yield to less than half that of the untreated control plants. Smaller concentrations had no noticeable effect upon the disease.

Application of lithium nitrate at the rate of 2·5 mg.-equiv./l. soil significantly reduced the diameter and weight of crown galls (*Bacterium tumefaciens*) of tomato. An increase in the fresh weight of the plants treated with lithium chloride over that of untreated plants was noticed 17 weeks after application. The effect of lithium nitrate on yield was negligible. There was a close relationship between the lithium concentration present in the galls and that applied, and a high inverse correlation between gall weight and the concentration of lithium in the gall. A considerable quantity of lithium was excreted from the treated plants in the leaves which fell prematurely.

Bose (S. R.). **The nature of the colouring substances in coloured Polyporaceae.**—*Trans. nat. Inst. Sci. India*, ii, 3, pp. 69–85, 4 pl. (2 col.), 1941.

In malt agar cultures of 13 coloured Polyporaceae, including *Polyporus zonalis*, *P. rubidus*, *Polystictus hirsutus*, *P. versicolor*, *P. sanguineus*, *Trametes persoonii*, and *Ganoderma lucidum*, the specific tints were observed in all cases to develop on the walls of the dead hyphae, either as a general staining substance or in the form of densely agglomerated pigment granules; living hyphae did not assume the coloration. The stain may serve a protective purpose, forming a cuticular covering for the hyphae within. The colouring matter of all the species was soluble in water, and (with the exception of *P. versicolor*) also in alcohol. Light apparently exerts no direct influence on colour production by the Polyporaceae.

A vacuolar stain of a very pale shade of pink (Hermosa of Ridgway), visible only under the oil immersion lens, occurs in the living hyphae both of coloured and white fungi of different groups and appears to be closely associated with metabolic processes.

Tilford (P. E.). **Ohio Potato diseases.**—*Bull. Ohio agric. Exp. Sta.* 615, 35 pp., 28 figs., 1940.

This bulletin, superseding No. 432 in the same series (1929) [*R.A.M.*, ix, p. 51], incorporates information accumulated since that date with the facts previously presented.

Black (L. M.). **Specific transmission of varieties of Potato yellow-dwarf virus by related insects.**—*Amer. Potato J.*, xviii, 8, pp. 231–233, 1941.

During each of the three past years, leafhoppers of the species *Agallia constricta* van Duzee (closely related to, but distinct from, *Aceratagallia sanguinolenta*, according to P. W. Oman in *Tech. Bull. U.S. Dep. Agric.* 372, 1933) collected in New Jersey were found to be carrying a strain of the potato yellow dwarf virus differing from the New York form in the symptoms produced on Green Mountain potatoes, crimson clover (*Trifolium incarnatum*), *Nicotiana rustica*, and *N. glutinosa*. Thus, on clover, the New Jersey strain, which it is pro-

posed to name *Marmor vastans* H. var. *agalliae* n. var., causes a rusty-brown necrosis of the veins and yellowing, chiefly of the older leaves, in contrast to the typical vein-clearing and chlorosis of the younger foliage associated with the New York form of the disease. Both on clover and *N. rustica* the New Jersey strain was much less invasive than that from New York. The high degree of specificity, possibly absolute, existing in the relationship between the two virus varieties and the two allied leafhoppers was illustrated by inoculation experiments on crimson clover, in which the New York strain was transmitted only by *A. sanguinolenta* and the New Jersey form exclusively by *Agallia constricta*. In two experiments the New Jersey strain protected *N. rustica* plants against the *lethale* variety of the New York virus [*R.A.M.*, xix, p. 725], which induced typical systemic symptoms of necrosis on the controls, consisting of some healthy plants and others inoculated with the unrelated viruses of tobacco ring spot and streak and potato calico.

Plummer (B. E.) & Bonde (R.). **Some relations between mercuric chloride content, acid content, and fungicidal efficiency of certain solutions as used for Potato tuber disinfection.** –*Phytopathology*, xxxi, 9, pp. 812–817, 1941.

The general reluctance of farmers to apply the mercuric chloride treatment for the control of the *Rhizoctonia* disease of potato tubers (*Corticium vagum*) [*C. solani*] in the United States is attributed largely to the tedious and complicated nature of the method. A series of trials was therefore conducted from 1937 to 1939 at the Maine Agricultural Experiment Station with a view to additional simplification and enhanced efficacy.

In laboratory tests the rapid lowering of the mercuric chloride concentration through successive treatments of unwashed potato tubers was appreciably retarded by curtailing the duration of each treatment from 90 to 10 minutes and by acidulating the solution with hydrochloric acid at the rate of 0·2 per cent. by weight, but not by reducing the length of each immersion in the acidulated solution. The reduction of mercuric chloride concentration in the acidulated solution was not affected by the use of hard rather than distilled water as a solvent. The turbidity of the treating solution was considerably reduced by acidulation. The acid was depleted more rapidly than the salt in the same solution. Similarly, in field trials the rapid lowering of the mercuric chloride concentration and consequent decline in the efficiency of control of *C. solani* were retarded by acidulation with hydrochloric or acetic acid (0·555 or 1·66 per cent. by volume), the latter being much more slowly depleted than the former and having the further advantage of being less injurious to human skin and clothing. As in the laboratory tests, acidulation reduced the turbidity of the solutions. Acidulation renders the mercuric chloride solution effective for 25 successive treatments, and in field trials in 1938 and 1939 the average percentages of clean plants for a series of 25 five-minute treatments in a mercuric chloride solution acidulated with hydrochloric acid were 74·2 and 88·4, respectively; in the latter year both the hydrochloric acid and mercuric chloride concentrations were higher than in

the former. The average percentage of clean plants for 25 five-minute dips in a mercuric chloride solution acidulated with acetic acid in 1939 was 88·7, though the mercuric chloride concentration was lower than in the solution acidified with hydrochloric acid in the same year.

Grütte (E.). **Rhizoctonia solani K. als Schädling der Kartoffelknolle.** [*Rhizoctonia solani* K. as a pathogen of the Potato tuber.]—*Z. PflKrankh.*, l, pp. 225–230, 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, ciii, 21–24, p. 412, 1941.]

Field observations on the occurrence of the potato tuber rot caused by *Rhizoctonia* [*Corticium*] *solani* [in Germany] are described. The incidence of infection, which is expressed by the formation of more or less deeply sunken, dry lesions surrounded by suberized tissues, varies with the variety and soil constitution, crops planted on clay soils suffering more severely than those on the lighter types. No isolation of the fungus was made.

Lutman (B. F.). **Actinomyces in Potato tubers.**—*Phytopathology*, xxxi, 8, pp. 702–717, 9 figs., 1941.

Studies at the Vermont Agricultural Experiment Station on the infection of Green Mountain potato tubers by *Actinomyces scabies* disclosed that infected lenticels (stained by a modification of the Gram technique described in *Stain Tech.*, xvi, pp. 63–66, 1941) showed guard cells surrounded by enlarged cells with thickened and browned walls presenting a wavy outline in section due to the presence of the pathogen, which generally appears to penetrate through the middle lamella, splitting the walls apart. In addition to infected lenticels patches of brown schizogenic spaces were visible, with *Actinomyces* filaments in the dark jelly filling the spaces. Infection apparently occurs, not only through the stomata and lenticels [*R.A.M.*, xix, p. 112], but also through any place on the skin where two cells join in the case of very small tubers (0·5 to 1 cm. in diameter). The hyphae of the fungus occupy the inside of the cell walls of the whole tuber, extending from the outer layer of cork to the centre. On a pectin jelly medium [ibid., iii, p. 198], two formulae for the composition of which are given, a chromogenic strain of *A. scabies* isolated from infected soil formed a profusion of white, flocculent colonies with numerous conidia and liquefied the medium. Bits of infected tuber tissue gave no growth of *Actinomyces* on these media, due, it is suspected, to the intimate relationship existing between host and parasite.

Krantz (F. A.) & Eide (C. J.). **Inheritance of reaction to common scab in the Potato.** —*J. agric. Res.*, lxiii, 4, pp. 219–231, 1941.

In field and greenhouse breeding studies in Minnesota the sexual progeny of 14 F_1, 32 F_2, and 18 F_3 segregates of the cross between the potato varieties Accession 123 (an unidentified clone obtained as a rogue in a field of Irish Cobblers) and Lookout Mountain were tested for reaction to common scab (*Actinomyces scabies*) [*R.A.M.*, xix, p. 42]. Assuming that the potato is an autotetraploid and the difference observed in reaction to common scab is principally due to the influence of one gene, the segregates were classified into five genetic groups

corresponding to breeding types designated as Sc_4, Sc_3sc, Sc_2sc_2, $Scsc_3$, and sc_4, separated in regions where the mean scab reaction of the sexual progenies showed the greatest discontinuity. One hundred and eighteen varieties and selections of heterogeneous origin were classified into these five groups as follows: type 1—the variety Hindenburg; type 2—seven selections and the variety Jubel; type 3—42 selections; type 4—31 selections and the variety Earlaine; and type 5—34 selections and the variety Chippewa. Hindenburg gave a progeny from which two segregates were isolated whose sexual progeny gave a significantly higher mean scab reaction than the progeny of Hindenburg. Crosses between types gave progenies whose mean reaction to scab was in general agreement with the reaction of the selfed progenies of the parents. Varieties Early Ohio, Triumph, and Warba were classified in type 5, from the mean scab reaction of the crossed progenies, obtained when these varieties were used as female parents. In a study of 13 crosses an association was found to exist between the colour factor P and the mean scab reaction; the mean scab reaction of the P and p plants for the 13 crosses was 2·49 and 1·99, respectively.

Goss (R. W.) & Jensen (J. H.). **Varietal susceptibility of Potatoes to Fusarium wilt.**—*Amer. Potato J.*, xviii, 7, pp. 209–212, 1941.

A tabulated account is given of a series of tests of varietal reaction to *Fusarium* wilt in potatoes conducted in 1939 and 1940 as part of the Nebraska breeding programme. In these two years inoculum of *F. solani* var. *eumartii* [*R.A.M.*, xix, p. 491] was added at the rate of ½ lb. per ft. of row just before planting, but the field had already been planted with severely infected seed tubers in 1936 and kept continuously under potatoes since that time. More than 90 per cent. of the foliar symptoms and practically all those of the tubers were characteristic of *F. solani* var. *eumartii*, the agent of stem-end rot and vascular discoloration of the tubers, though *F. solani* and *F. oxysporum* were also present in the field. In both years the Pontiac, Katahdin, Golden, and Sebago varieties and two hybrids, B 5 and B 4 1 (Minn. 1. 33–1–34 and Minn. 29. 32–1–34) proved to be highly resistant, with infection percentages in 1939 of 0·6, 2·2, 2·6, 0·8, 1·5, and 0·9, respectively, and in 1940 (a season of much greater severity of the pathogen), 7, 7, 5·5, 7·3, 4, and 6, respectively. White Rose, Earlaine, and Chippewa were much more susceptible, while Mesaba and Warba sustained even heavier damage than the Irish Cobbler and Bliss Triumph controls. Of the four German varieties included in the tests but not tabulated, Hindenburg and Jubel were highly resistant, Arnica about on a level with the best American varieties, and Erstling [Duke of York] equally susceptible with Irish Cobbler and Bliss Triumph.

Jensen (J. H.) & Goss (R. W.). **Infection of first-year Potato seedlings with Fusarium solani var. eumartii.**—*Amer. Potato J.*, xviii, 8, pp. 239–242, 1941.

The testing of first-year seedlings for resistance to *Fusarium solani* var. *eumartii* in the greenhouse has proved to be an effective method of eliminating susceptible individuals at the Nebraska Agricultural Experiment Station [see preceding abstract]. This practice obviates

the disadvantage of the high cost of growing plants from tubers and reduces the large number of escapes apt to occur in the field. The symptoms of the disease, which appear about a month after transplanting, are as clearly defined in the seedlings as in plants raised from tubers, and the results of the limited tests to date indicate that the desirability of parent stock for breeding purposes can be readily determined by the new method. In an experiment in which 341 seedlings from six different crosses were planted in inoculated sterilized soil, 250 became infected and 91 remained healthy. In a second-year test of 33 surviving clones (130 plants) in inoculated non-sterilized soil, 26 contracted the disease and 7 remained healthy, while in the third year in the field, eleven out of twelve clones (53 plants) were sound, only one of the 221 tubers produced showing vascular discoloration.

Tipograf (D. Y.). Ускоренный способ обнаружения кольцевой гнили Картофеля. [A rapid method of diagnosing ring rot of Potato.]—*C.R. Pan-Sov. V.I. Lenin Acad. agric. Sci., Moscow, 1941,* 5, pp. 35–38, 1 fig., 1941.

The author describes an accurate and quick method (requiring two to three minutes) of diagnosing potato ring rot (*Bacterium sepedonicum*) [*R.A.M.*, xx, p. 419]. It consists in an agglutination test in which plant juice from a diseased stem or tuber is mixed with (1) immune serum obtained by injecting a pure culture suspension of *Bact. sepedonicum* into rabbits and (2) normal serum; in case of a positive reaction the drop containing the immune serum becomes flocculent and lighter in colour, while the drop with the normal serum used as a control remains turbid. In parallel tests the results obtained by means of the microscope in most cases entirely coincided with the serological data, but sometimes remained somewhat indefinite. In tests of the specificity of the immune serum it was found that 59 out of 60 strains of bacteria isolated from potatoes affected by ring rot yielded clearly negative results and the remaining strain induced an indefinite reaction. Application of the serological method in the field showed that 22·9 per cent. of apparently healthy, well-developed plants were infected, and it is concluded, therefore, that appraisal of healthy plants by external appearance only does not offer sufficient guarantee against the presence of ring rot. Stems containing *Bact. sepedonicum*, when dried at room temperature, retained their capacity to agglutinate after 100 days of storage; pure cultures of the organism retained theirs after being dried at 80° C. for 50 minutes. This shows that the serological method of diagnosis can be made with both fresh and dried stems of the potato.

Werner (H. O.) & Dutt (J. O.). **Reduction of cracking of late crop Potatoes at harvest time by root cutting or vine killing.**—*Amer. Potato J.*, xviii, 7, pp. 189–208, 5 figs., 3 graphs, 1941.

Cracking of the tubers at harvest time is stated to be the most serious grade defect ordinarily encountered by growers of late-crop Bliss Triumph potatoes in the northern high plains. Investigations at the Nebraska Agricultural Experiment Station showed the condition to be probably due to a great increase in turgidity resulting from a sharp reduction of transpiration while the roots are well supplied with mois-

ture, or from an abrupt increase in soil moisture following a dry spell and coinciding with a slow transpiration rate [cf. *R.A.M.*, xx, p. 377]. Root-cutting by means of a modified potato digger blade effectively diminished the incidence of cracking, the action of a killing spray (3 per cent. elgetol extra) on the aerial portions of the plants being slower and less extensive. Root-cutting gave less reliable results in wet soils and on over-mature plants, the high turgidity of the tubers in such cases being apparently maintained by direct absorption of water through the skin, and some loosening of the soil to promote drying-out is therefore advisable. The amount of cracking fluctuated from day to day and throughout a given day, increasing overnight or during cold and overcast periods and declining in bright or windy weather. Bliss Triumph and Pontiac tubers were found to be the most susceptible to cracking, while Mesaba and Warba were less susceptible, and Irish Cobbler, Chippewa, and Katahdin were virtually immune from the trouble.

Robinson (Ursula M.). **Blackening of Potato tubers on boiling.**—*Nature, Lond.*, cxlvii, 3738, pp. 777–778, 1941.

The author points out that the black coloration which develops in some potato tubers after boiling [*R.A.M.*, xv, p. 526] cannot be due to the presence of melanin, as it disappears in acid solution at about P_H 3, at which value melanin is stable. Estimation of the iron content of numerous tubers revealed a marked correlation between this and the incidence of blackening, the tubers which developed the discoloration all containing more iron than those which remained normal. Almost all of the extractable iron appeared to be in the ferrous state. It is tentatively suggested that in raw tubers the precursor of the black pigment exists in the form of ferrous iron bound in a loose complex, possibly in combination with proteins. This complex is hydrolysed on boiling, and the iron is then precipitated as a colourless ferrous compound, probably the hydroxide, which is gradually oxidized to the black oxide as air reaches the tissues.

Cowie (G. A.). **Blackening of Potato tubers on boiling.**—*Nature, Lond.*, cxlviii, 3749, pp. 285–286, 1941.

From an examination of samples obtained from approximately 40 modern replicated fertilizer experiments the author found that the typical grey to black discoloration that develops in potatoes after boiling [see preceding abstract] was confined to tubers grown on plots deficient in potash, but with a relatively high nitrogen level in the soil. It has been shown by various workers that in potash-starved plants the amino acids increase relatively to the protein, owing, in part at least, to the breakdown of protein. These changes may result in an abnormal distribution of iron in the plants and a higher concentration in potato tubers. Hoffer (*Bull. Ind. agric. Exp. Sta.* 298, 1930) has shown that maize plants grown under conditions of potash deficiency accumulate iron compounds in the nodes and the potassium content in relation to the iron content of tubers that blacken on boiling is therefore of particular interest.

De Jong (W. H.). **Over de bestrijding van eenige ziekten, die houtwonden aan het onderste deel van den stam van Hevea veroorzaken.** [On the control of some diseases causing wood injuries on the stem base of *Hevea*.]—*Bergcultures*, xv, 33, pp. 1134–1137, 1941.

Previous recommendations for the control of collar rots of *Hevea* rubber trees in the Dutch East Indies are summarized and discussed in the light of the author's experience. Three distinct types of decay are recognized, caused by (*a*) *Phytophthora* and *Pythium* spp., (*b*) *Ustulina zonata*, and (*c*) *Rosellinia bunodes*. Treatment for cankers of the first-named type necessitates the careful removal of the diseased bark, trimming of the wound, and the application to the exposed areas of a strong antiseptic, e.g., 10 per cent. carbolineum plantarum, but the bark should not be scraped unless the black film produced by *Diplodia* [*Botryodiplodia theobromae*] has to be removed. The cut surface, when thoroughly dry, is covered, e.g., with asphalt B.P.M. 20 30, an external coating of whitewash also being applied in regions with a well-marked dry season. The wounds should be inspected once or twice a year to ascertain that callus formation is proceeding normally. Drastic excisions are indicated in the case of *U. zonata*, which is a true wood parasite, followed by annual applications of tar to the wounds.

In the case of *R. bunodes* infected wood should be removed, the wounds treated, and recurrences of the attack forestalled by the eradication of suckers and clearing of the ground surrounding the trees—an important measure also in the control of cankers.

In the treatment of cankers, the writer cannot, at any rate without further investigation, endorse the methods now being advocated which entail the excision of the discoloured wood. It is true that the xylem cells are occupied by fungal elements, but these are in no sense parasitic on the wood, though they might possibly weaken it and so pave the way for more aggressive pathogens. Examples of this kind, however, have not come within the author's experience.

Hunger signs in crops: a symposium.—xiii+327 pp., 79 col. pl., 94 figs., 1 graph, Washington, D.C., The American Society of Agronomy and The National Fertilizer Association, 1941. $2.

The scope of this valuable manual may be illustrated by the headings of the nine chapters (each followed by a bibliography) into which it is divided, viz., (I) Why do plants starve? by G. D. Scarseth and R. M. Salter; (II) Plant-nutrient deficiency in tobacco by J. E. McMurtrey; (III) Deficiency symptoms of corn and small grains by G. N. Hoffer; (IV) Plant-nutrient deficiency symptoms in the potato by H. A. Jones and B. E. Brown; (V) Plant-nutrient deficiency symptoms in cotton by H. P. Cooper; (VI) Plant-nutrient deficiencies in vegetable or truck-crop plants by J. J. Skinner; (VII) Nutrient-deficiency symptoms in deciduous fruits by O. W. Davidson; (VIII) Plant-nutrient deficiency symptoms in legumes by E. E. De Turk; (IX) Symptoms of citrus malnutrition by A. F. Camp, H. D. Chapman, G. M. Bahrt, and E. R. Parker. The foreword explaining the origin and purpose of the work is by G. Hambidge. Special mention should be made of the excellent coloured plates and black-and-white figures designed to assist in the

rapid identification of the various disorders associated with the lack of essential nutritive elements.

Drake (M.), Sibling (D. H.), & Scarseth (G. D.). **Calcium-boron ratio as an important factor in controlling the boron starvation of plants.**—*J. Amer. Soc. Agron.*, xxxiii, 5, pp. 454–462, 1 fig., 1941.

In experiments at the Indiana Agricultural Experiment Station the growth of Turkish tobacco on a Norfolk sand in greenhouse pots appeared normal when the calcium-boron ratio in the plants did not exceed 1,340 : 1, whereas severe boron starvation symptoms developed in those with a calcium-boron ratio of 1,500 : 1. These results, taken in conjunction with those of other workers, denote that boron starvation occurs as a sequel to an unfavourable calcium-boron ratio.

Atwater (C. G.). **The ancient history of boron deficiency symptoms.**—*J. Amer. Soc. Agron.*, xxxiii, 10, pp. 939–942, 1941.

The writer briefly summarizes the literature on some diseases of agricultural crops formerly attributed to a variety of causes but now recognized to be associated with boron deficiency and curable by the application of this element to the soil in an appropriate form.

Carlyle (R. E.) & Norman (A. G.). **Microbial thermogenesis in the decomposition of plant materials. Part II. Factors involved.**—*J. Bact.*, xli, 6, pp. 699–724, 13 graphs, 1941.

In the course of studies at the Iowa Agricultural Experiment Station on microbial thermogenesis in relation to the decomposition of plant materials [*R.A.M.*, xiv, p. 55], the writers carried out experiments with pure cultures of *Aspergillus fumigatus* in a specially constructed fermentation vessel referred to as the adiabiatic apparatus [which is fully described in a previous paper: Part I of the same series, in *J. Bact.*, xli, 6, pp. 689–697, 2 diags., 1941]. The mould raised the temperature of the inoculated oats straw from 25° to nearly 55° C. in 38 hours, with a peak rate of 2·3° per hour at 40·7°.

Wedberg (S. E.) & Rettger (L. F.). **Factors influencing microbial thermogenesis.**—*J. Bact.*, xli, 6, pp. 725–743, 1941.

During preliminary heating experiments at Yale University, New Haven, Connecticut, with unsterilized maize, the writers isolated in pure culture three moulds, viz., *Rhizopus mucor* and two species of *Aspergillus* [cf. preceding abstract], one green and the other brown, all of which made luxuriant growth in 48 hours at room temperature on 3 per cent. maize extract agar. To determine the thermogenetic capabilities of these fungi, each was inoculated into an appropriate amount of glucose broth (P_H 6), and after 24 hours' incubation at room temperature the cultures were applied to sterile maize in insulated Dewar flasks with an oxygen aeration system (L. H. James, Microbial thermogenesis, Dissertation Yale Univ., 1927), bringing the moisture content of the substratum up to 30 per cent. Within three days temperatures of 57°, 53°, and 55·5° C. were attained with the cultures of *R. mucor* and the brown and green species of *Aspergillus*, respectively.

Nusbaum (C. J.). **The role of hot water seed treatment in the control of Cercospora blight of Benne.**—Abs. in *Phytopathology*, xxxi, 8, p. 770, 1941.

In 1939 the benne (*Sesamum indicum*) crop in the coastal region of South Carolina, where it is widely grown as food for doves in hunting preserves, was severely damaged by blight (*Cercospora sesami*) [*R.A.M.*, xvii, pp. 294, 296], which was found to be present to a maximum extent of 16 per cent. internally in seed samples from the same State, Georgia, and Florida. Virtually complete control of this source of contamination was effected by 30 minutes' immersion of the seed in water heated to 128° F., while surface-borne inoculum was eliminated by treatment for the same period at 118°. Over one year's storage freed heavily diseased seed from superficial infection but the fungus still persisted in the interior. The practical utility of the hot-water treatment was demonstrated on large-scale plantings in 1939 and 1940.

Bell (A. F.). **Cane disease control boards. School of instruction for inspectors.**—*Aust. Sug. J.*, xxxiii, 3, pp. 123, 125, 1941.

Fifteen representatives of seven of the eight cane disease control boards constituted under the 1938 amendment of the Sugar Experiment Stations Acts attended a school of instruction held at the Bundaberg (Queensland) Sugar Experiment Station from 12th to 16th May, 1941, at which lectures and laboratory demonstrations were given and the more important sugar-cane diseases individually studied with a view to familiarizing inspectors with their symptoms and so facilitating early recognition and prompt application of control measures. By this means it is hoped to arrest the spread of serious diseases to non-infected areas.

Edgerton (C. W.). **The mosaic disease and Co. 281.**—*Sug. Bull., N.O.*, xix, 10, pp. 28–29, 1941. [Abs. in *Sugar*, xxxvi, 8, p. 43, 1941.]

The Co. 281 sugar-cane variety, though very valuable from the standpoint of its adaptability to Louisiana conditions, sustains virtually 100 per cent. damage from mosaic [*R.A.M.*, xviii, p. 621], and it is questionable whether it can be cultivated on a profitable basis, though at the moment it seems impracticable to discard it in the absence of any promising substitute. This being the case, it is absolutely essential to secure disease-free seed stock by the systematic and thorough roguing of fields set aside for the purpose.

Martin (G. W.). **Outline of the fungi.**—*Univ. Ia Stud. nat. Hist.*, xviii (Suppl.), 64 pp., 8 pl., 1941.

This supplement is the writer's valued 'Key to the families of fungi' [*R.A.M.*, xix, p. 365] in its latest form with the addition of a short account of the lichens and eight plates giving details of representative named fungi.

Henrici (A. T.). **The yeasts : genetics, cytology, variation, classification and identification.**—*Bact. Rev.*, v, 2, pp. 97–179, 1941.

This is an exhaustive critical discussion of outstanding contributions (mostly of the past decade) to the knowledge of the genetics, cytology,

induced and spontaneous variations and mutations, classification, and identification of yeasts, including those concerned in the etiology of various human and animal diseases, and species of interest in connexion with the fermentation industries. A six-page bibliography is appended.

Teng (S. C.). **Supplement to higher fungi of China.**—*Sinensia*, xi, 1–2, pp. 105–130, 1940.

Included in this critically annotated list of species of fungi additional to those already cited in the author's 'Higher Fungi of China' are *Ascochyta phaseolorum* on bean (*Phaseolus vulgaris*) and cowpea leaves, *Septoria lactucae* on lettuce foliage, *Alternaria brassicae* (Berk.) Sacc. on cabbage, and *Oospora citri-aurantii* and *Alternaria citri* on tangerine orange (*Citrus nobilis* var. *deliciosa*) fruits, all in Szechwan. *Chrysomyxa tsugae* n.sp. is closely related to *C. abietis* [*R.A.M.*, xvii, p. 348], from which it differs chiefly in its rotund and less elongated orange sori, 0·6 to 1·2 mm. in diameter, 0·5 to 0·7 mm. in height, broader teleutospores (16 to 29 by 14 to 21 μ), and its occurrence on *Tsuga yunnanensis* in the Hunba Forest, Sikang, mostly isolated, young, over-topped trees being attacked, sometimes with the loss of almost all the needles. The pycnidial, aecidial, and uredo stages of the rust are unknown. The oblong, ovoid, or subglobose, hyaline- and smooth-walled teleutospores occur in chains of 20 to 25 in columns 300 to 500 μ long.

Supplementary notes and particulars as to distribution are given in connexion with species previously reported.

Ou (S. H.). **Phycomycetes of China I. II.**—*Sinensia*, xi, 1–2, pp. 33–57; 5–6, pp. 427–449, 32 figs., 1940.

Included in this critically annotated list of Phycomycetes from Szechwan, China, is a new species of *Plasmopara*, *P. calaminthae*, found on the leaves of *Calamintha chinensis*. *Empusa muscae* was found on a species of Cordyluridae attached to a head of barley and *E. grylli* [*R.A.M.*, xviii, p. 140] on locusts.

Jenkins (Anna E.) & Cheo (C. C.). **Descriptions of Elsinoe dolichi, n.sp., and Sphaceloma ricini, n.sp.**—*J. Wash. Acad. Sci.*, xxxi, 9, pp. 415–417, 1941.

Pending the publication of a full description of *Elsinoe dolichi* Jenkins, Bitancourt & Cheo n.sp. on *Dolichos lablab* and *Sphaceloma ricini* Jenkins & Cheo n.sp. on *Ricinus communis*, both observed in Yunnan, China, Latin diagnoses are given of the two species. *E. dolichi* produces on the leaves of its host pale yellow lesions, sometimes furnished with chestnut-coloured, often raised margins, more or less following the course of the veins, up to 4 mm. in diameter; on the petioles and stems globose, becoming elliptical or elongated, flat or sunken cankers, up to 1 cm. by 3 mm., of a pale colour, sometimes provided with yellow or black to purple, often raised margins; and on the pods roughly orbicular, punctate cankers, up to 5 mm. in diameter, usually brown or purplish-brown with pale centres; the mostly pulvinate, often erumpent, amphigenous ascomata measure 60 to 300 by 100 μ and are occupied by one or more layers of subglobose

to piriform or ellipsoid asci, 20 to 32 by 15 to 22 μ, containing hyaline, uni- to trisceptate ascospores, 7 to 13 by 3 to 5·2 μ; the conidiophores, 10 by 3·6 to 5·3 (at the base) μ, bear on the host few, scattered, elliptical conidia, up to 3·5 μ in diameter, while in culture these organs may be globose, 2·5 to 3·5 μ in diameter, or ellipsoid, 3 to 4·6 by 1·5 to 1·8 μ, and are hyaline. The fungus was also found on material of the same host from Kenya and Uganda.

The lesions formed by *S. ricini* on the leaf blades of castor beans are orbicular or suborbicular, of a papery texture, averaging 2 to 3 mm. in diameter, subcontinuous along the veins, verruciform; on the petioles and stems they are elliptical to elongated, often acuminate at both ends, reddish-brown at first, then yellow or white with a brown or black to purple margin; the conidiophores, which are subuliform or cylindrical, mostly simple, continuous or uniseptate, 10 to 30 by 3 to 5 μ, occur in compact yellowish or amber coloured palisade or separated or single, and bear apical and terminal, oblong, ovoid, or elliptical conidia, some only 1 to 2 μ in diameter, others up to 10 to 15 by 2·5 to 4·5 μ, the small ones hyaline and the larger often yellowish and fusiform. Material of the fungus from the same host in Formosa, Japan, was also examined.

Wager (V. A.). **Descriptions of the South African Pythiaceae with records of their occurrence.** *Bothalia*, iv, 1, pp. 3–35, 18 figs., 1941.

After stating that the Pythiaceae are common and widely distributed in South Africa, where they have been isolated on over 100 occasions from 44 different hosts, the author gives full, annotated descriptions of the fungi of this group collected (mostly by himself) in the Transvaal and neighbouring localities. All are allocated to 10 known species of *Pythium*, viz., *P. ultimum* (locally the commonest of the Pythiaceae), *P. aphanidermatum*, *P. irregulare*, *P. vexans*, *P. myriotylum*, *P. splendens*, *P. spinosum*, *P. acanthicum*, *P. oligandrum*, *P. de Baryanum* (= *P. fabae*), and *P. de Baryanum* (= *P. de Baryanum* var. *pelargonii*), and 7 of *Phytophthora*, viz., *P. infestans*, *P. parasitica*, *P. citrophthora*, *P. cactorum* (= *P. citricola*), *P. cinnamomi*, *P. cryptogea*, and *P. syringae* (*P. hibernalis*). Two tables are given showing the temperature relations of these fungi, and the paper concludes with an annotated host index and a bibliography of 30 titles.

Doidge (Ethel M.). **Some South African Valsaceae.** *Bothalia*, iv, 1, pp. 47–90, 15 pl., 1941.

Descriptions are given of all fungi of the Valsaceae recorded from South Africa, including some species, apparently hitherto undescribed, collected by MacOwan and Medley Wood towards the end of the nineteenth century [cf. *R.A.M.*, xviii, p. 819]. No attempt could be made at a natural classification, and an artificial key to the genera is provided. The fungi dealt with include *Valsa leucostoma* [ibid., xvii, p. 46], *Diaporthe citri*, of which the conidial form, *Phomopsis citri*, is moderately common on citrus fruits and twigs in the Union and in Rhodesia [ibid., xvii, p. 311], and *D. perniciosa*, the *Phomopsis* stage of which [*P. mali*] has been observed on apple twigs in [Southern] Rhodesia [ibid., xvii, p. 755].

Doidge (Ethel M.). **South African Ascomycetes in the National Herbarium.** *Bothalia*, iv, 1, pp. 193–217, 5 figs., 1941.

Descriptions are given of 36 South African Ascomycetes, including 13 species regarded as new.

Doidge (Ethel M.). **South African rust fungi. IV.** *Bothalia*, iv, 1, pp. 229–236, 6 figs., 1941.

In continuation of her earlier work [*R.A.M.*, xix, p. 168] the author gives descriptive notes on 13 further species of South African rusts, including eight new species and one new name. The rusts listed include *Puccinia antirrhini* on *Antirrhinum majus* leaves and stems, first recorded in South Africa in 1939 [ibid., xix, p. 350], *P. kuhnii* on leaves of *Saccharum spontaneum*, *P. mcClean ii* n.sp. on leaves of *Gladiolus ludwigius*, and *Uromyces dolicholi* on leaves of pigeon pea.

Mendoza (J. M.) & Leus-Palo (Simeona). **New or noteworthy Philippine fungi, III.**—*Philipp. J. agric.*, lxxv, 2, pp. 165–183, 9 figs., 1941.

In this paper [cf. *R.A.M.*, xii, p. 115] the authors describe nine new species of *Cercospora* found in the Philippine Islands, including *C. carthami* n.sp. on the leaves of safflower (*Carthamus tinctorius*). In addition, 20 fungi are newly recorded, including *Cercospora chrysanthemi* on leaves of *Chrysanthemum* sp., *Cercospora cucurbitae* on leaves of squash (*Cucurbita pepo*), *Cercospora hydrangeana* on leaves of *Hydrangea ortensia*, *C. sorghi* on maize leaves, and *C. pachypus* on sunflower leaves.

Dearness (J.). **New species of Tennessee fungi.** *Mycologia*, xxxiii, 1, pp. 360–366, 1941.

This is a list of 17 hitherto undescribed fungi (including a few new combinations and varieties and one fungus described on another host), collected in Tennessee since the destruction by fire of the University of Tennessee herbarium in 1934. The new species listed include *Phyllosticta hesleri* on *Acer saccharum*, *Phlyctaena tiliae* on *Tilia americana*, *Leptothyrium parvulum* and *Glocosporium ferrugineum* on *Rhododendron punctatum*, *Leptostromella bignoniae* on *Bignonia capreolata*, *G. papulatum* on *Rubus canadensis*, and *Cercospora halesiae* on *Halesia carolina*. *Dothiorella mali* Karst. *fructus* var. nov. on decaying fruit of apple is stated to be very near *D. cydoniae*, which Saccardo considers to approximate to *D. mali*, the conidial measurements being 6 to 10 by 3 μ for *D. mali* and 10 to 12 by 3·5 μ for *D. cydoniae*. *Coryneum rhododendri* Schw. *fusoideum* var. nov., apparently parasitic on *Rhododendron catawbiense*, is stated to have features common to both *C. rhododendri* and *C. triseptatum*. *Cladosporium epiphyllum* is considered to be possibly the cause of circular dark leaf spots on *Robinia pseud-acacia*. *Briosia azaleae* (Peck) comb. nov. is given as a synonym of *Periconia azaleae* and *Sporocybe azaleae* [*R.A.M.*, xix, p. 599].

Subba Rao (M. K.). **Report of the Mycologist, 1940–41.** *Adm. Rep. Tea sci. Dep. unit. Plant. Ass. S. India, 1940–41*, pp. 51–62, 2 graphs, 1941.

In this report [cf. *R.A.M.*, xviii, p. 821] it is stated that infection

of tea leaves by *Corticium invisum* [loc. cit.] has now become serious in the region of the Anamalai Hills, Madras.

A heavy outbreak of black root rot (*Rosellinia arcuata* and *R. bunodes*) [ibid., xviii, p. 579; xix, p. 369] occurred in the Nilgiri-Wynaad area. The presence of decaying organic matter is essential for the development of infection. The disease thrives in neutral and alkaline conditions, and tolerates moderately acid ones. Within a year of being buried in the soil incompletely decayed prunings had developed fructifications of *R. arcuata* and *R. bunodes*. It was ascertained that infection may begin near the collar (sometimes above it) and spread both upwards and downwards. As regards control, whether infection comes from the roots or the aerial parts, all sources of infection must be removed before disinfection is undertaken. If the attack begins in the aerial parts, the ground round the perimeter of the bush must be cleared. Weeds, mulch, and buried prunings must be removed, and the collar exposed sufficiently to reveal any fungal growth on the plant organs. The collected waste may be scorched with a blow-lamp and later removed for thorough burning, when the bushes have been disinfected. If careful inspection shows infection to be no more than superficial, the only treatment necessary may be to apply a fungicide to the affected area, with or without scraping off the superficial mycelium. If the fungus has invaded the tissues, all the affected part must be cut back to the healthy wood [cf. above, p. 42]. After the diseased tissues have been removed, the plant must be treated with a fungicide. Very encouraging results have followed even a single application of 1 per cent. Burgundy mixture, which not only controlled the disease, but also exercised a tonic effect, causing the formation of more buds on the treated surface. Any recurrent cases should receive attention from a gang going round at regular intervals. All treated bushes must be constantly inspected.

Treatment along these lines appears to have cost from 20 to 50 rupees per acre, and more than 100 acres have been dealt with. As the value of a tea bush is 8 annas, the procedure has been well worth while. Clear indications exist that, after nearly eight months, the disease has been checked, and the number of dead bushes reduced to negligible proportions.

The defoliation and gradual deterioration of *Grevillea robusta* trees in the High Range mountains, attributed hitherto to a *Phyllosticta* [ibid., xix, p. 678], have now been found to be associated also with a *Cercospora*. Direct evidence conclusively demonstrated that the leaf fall, die-back, branch canker, and gummosis were due to the effects of winds and adverse soil and climatic conditions. The fungi were of secondary importance.

Albizzia moluccana in the Wynaad district showed defoliation due to infection by a *Cercosporella*, favoured by misty, humid conditions.

Johnson (J.). **Chemical inactivation and the reactivation of a plant virus.**—*Phytopathology*, xxxi, 8, pp. 679–701, 1 fig., 1941.

For his studies at the Wisconsin Agricultural Experiment Station on the influence of 41 chemicals on the infectivity of the ordinary tobacco mosaic virus the writer made use of a special technique [which

is fully described], herein referred to as the agar disk method, permitting the diffusion of the test substances to the virus and their subsequent partial or complete extraction with water.

Among the common organic substances found to act as immediate inactivators were milk, blood serum, citrus fruit, *Phytolacca rigida*, and aphid extracts, trypsin [*R.A.M.*, xiv, p. 199], the growth products of *Aerobacter aerogenes* [ibid., xvii, p. 209] and *Aspergillus niger*, and charcoal. Milk (whole, skimmed, or whey) was almost as effective in dilutions of 1 : 10 as at full strength, and its inhibitory property was not appreciably impaired by pasteurization, sterilization, or boiling. Cucumber virus 1 and the potato veinbanding and tobacco etch viruses proved even more sensitive to the action of milk than tobacco mosaic, but potato ring spot was somewhat more resistant. These data suggest the utility of some such substance as milk for the separation of certain virus combinations [ibid., xviii, p. 266]. The results obtained in the present investigation with the *Aerobacter* inactivator are comparable to those secured by Stanley with 2 per cent. trypsin [ibid., xiv, p. 199], the former, however, being even more effective in the reduction of infection on application following inoculation, while treatment of the host before inoculation often inhibited the development of symptoms for as long as a week. At the same time there is no evidence that trypsin, blood serum, milk, and other substances of like efficiency as virus inactivators modify the host in such a way as to immunize it against infection, their effects being apparently achieved by the formation of a relatively loose specific molecular union (chemical adsorption or physical absorption), usually disintegrating on the removal of the inhibitor with water.

Among the 28 inactivating chemicals permitting partial or total reactivation of the virus following extraction with water were nitric, hydrochloric, acetic, citric, lactic, oxalic, picric, and tannic acids, ten inorganic salts (including ammonium and copper sulphates, lead acetate, and mercuric chloride), formalin, and alcohol. On the other hand, 0·1 per cent. bromine, 3 per cent. hydrogen peroxide, 1 per cent. iodine in potassium iodide, 1 per cent. *P. rigida* extract, 0·05 per cent. potassium permanganate, 0·05 per cent. safranin, 0·1 per cent. trisodium phosphate, and 0·5 per cent. potassium hydroxide consistently failed to allow of any appreciable degree of reactivation. Chemicals able to cause destruction or death of the virus may be grouped as toxic agents, oxidizing agents, and reagents with a P_H of approximately 1·5 or lower and 11·0 or above.

It is suggested that the term inactivation (as opposed to destruction) be reserved to express temporary loss of infectivity.

Stanley (W. M.). **Chemical properties of viruses.**—*Sci. Mon., N.Y.*, liii, 3, pp. 197–210, 14 figs., 1941.

In this review the author states that in his studies with C. A. Knight, the proportions of certain aromatic amino acids were found to vary with the strain of the tobacco mosaic virus under investigation. For instance, the analysis of twelve preparations of tobacco mosaic virus gave 3·8, 4·5, and 6 per cent. of tyrosin, tryptophane, and phenylalanin, respectively, while the corresponding values in the case of the Holmes

rib grass [*Plantago lanceolata*] strain of the tobacco mosaic virus were 6·4, 3·5, and 4·3 per cent., and in that of the nearly related cucumber mosaic virus 4, 3·8, 1·4, and 10·2 per cent., respectively. These data are regarded as significant in connexion with the mutation of a virus, the formation of a new strain of which induces a fresh set of symptoms.

Some progress has been made in the development of methods for modifying the chemical structure of the tobacco mosaic virus without impairing its infective activity. Thus, Dr. Anson and the writer found that the sulfhydryl groups of the virus can be abolished by reaction with iodine without any sacrifice of its normal biological activity, though the structural change due to the iodine treatment was not perpetuated in succeeding generations. With Dr. Miller it was demonstrated that most of the amino groups of the tobacco mosaic virus may be acetylated by means of ketene without causing a measurable change in the specific virus activity or in the nature of the disease induced in tobacco. Similar results have been obtained with virus modified by the introduction of some 3,000 phenylureido groups per molecule of virus by means of reaction with phenylisocyanate. These data indicate that a large portion of the surface structure of the virus may be changed without interference with the basic reaction of virus reproductions. Immense importance is attached by the author to 'the purposeful production of new and useful strains (of viruses) by chemical means', not only from a practical standpoint, but also in relation to the wider and fundamental problem of the nature of virus activity.

Spencer (E. L.). **Correlation of activity per unit weight of Tobacco-mosaic virus with age of lesion.**—*Science*, N.S., xciv, 2430, pp. 96–97, 1941.

In studies at the Rockefeller Institute for Medical Research the biological activity of ultracentrifuged tobacco mosaic virus per unit weight of virus protein was assayed on Early Golden Cluster bean [*Phaseolus vulgaris*] plants by the local lesion method, as modified by Spencer and Price (*Amer. J. Bot.*, xxviii, 1941).

The results obtained demonstrated that the content of virus protein in an inoculated tobacco leaf and also the activity per unit weight of the material continued to increase for twenty days after inoculation. The virus, apparently, was less active in young than in older lesions. It was also found that virus protein from the inoculated leaf was more active than that isolated at the same time from the top of the plant. Preliminary analyses with the ultracentrifuge showed that a preparation from the old lesions had only one component; a sample prepared at the same time from young lesions appeared to be made up of two components, of which one was approximately twice the length of the other, as determined by the sedimentation constant.

Experimental evidence also indicated that nitrogen may be an important factor in increasing the activity per unit weight of virus *in vivo*. When nitrogen was withheld from the tobacco plant 10 days after inoculation, virus protein in the inoculated leaf continued to form for about the usual period, but its activity, on a weight basis, remained fairly constant at the level reached about the time when nitrogen was last added. Activity at this point was about half that ultimately

displayed by virus protein from normal, nitrogen-fed plants. Preliminary tests indicated that it may perhaps be possible to increase this unit activity *in vitro* by supplying the virus with suitable forms of nitrogen.

It is evident from these observations that virus in new lesions displays on a unit weight basis only a fraction of its potential biological activity, and that it may differ in size and shape from virus isolated from older lesions.

Bouguy (S. M.). Об уходе за махорочными растениями, пораженными вирусом. [On the treatment of Indian Tobacco plants affected by virus.]—*C. R. Pan-Sov. V. I. Lenin Acad. agric. Sci., Moscow, 1941*, 5, pp. 11–15, 2 figs., 1941.

The losses caused by tobacco mosaic in the U.S.S.R. [*R.A.M.*, xx, p. 324] are stated to amount approximately to from 3 to 5 per cent. of the entire yield of ordinary tobacco [*Nicotiana tabacum*], while those of Indian tobacco [*N. rustica*] are only slightly less. During 1940, virus diseases, and particularly one resembling mosaic, were very prevalent on Indian tobacco in the Ukraine. In an attempt to control the disease, the tops of the plants with the deformed leaves were pinched out just above the healthy looking leaves on the assumption that (1) the older parts of the plants would be more resistant to infection, (2) the water balance of the plant would be thus improved, and (3) the side shoots growing from the lower part of the plant would encounter more favourable climatic conditions, developing as they did later in the season. The results of this treatment applied on several farms showed that plants thus treated developed healthy side shoots and weighed on the average 86 per cent. of the weight of a healthy plant, whereas diseased untreated plants weighed only 36 per cent. The nicotine content of treated plants was higher (9·05 per cent.) than that of the untreated, whether diseased (6·28 per cent.) or healthy (8·24 per cent.). Treated plants usually reached commercial maturity slightly later than healthy ones. The side shoots were stronger and their leaves larger and more healthy in appearance the lower the level at which the top was broken off.

Kausche (G. A.). **Über Transplantation und Kreuzungsversuche zur Frage der natürlichen und erworbenen Infektreaktion bei virus infizierten Tabakpflanzen.** [On transplantation and hybridization experiments in connexion with the question of the natural and acquired reaction to infection in virus-infected Tobacco plants.]—*Naturwissenschaften*, xxix, 27, pp. 404–405, 1941.

The grafting of *Nicotiana glutinosa* (reacting to the tobacco mosaic virus by the development of isolated lesions) on Samson tobacco (responding with systemic symptoms) resulted in the former giving both local and systemic symptoms on infection, indicating that the stock secretes a substance reversing the normal reaction. However, axillary buds removed from the scion and rooted reacted similarly to normal *N. glutinosa* plants. On the other hand, no such reversal in the response of *N. glutinosa* to the virus follows the grafting of Samson on *N. glutinosa*, infection being localized in the stock and the scion remaining free from infection. In grafts of *N. glauca* (symptomless) on

Samson and reciprocally, a reversal of the normal reactions occurs only if Samson is inoculated.

In crossing experiments in both directions with Samson and *N. glutinosa*, when *N. glutinosa* provided the pollen, the F_1 progeny took almost entirely after the former in growth habit, whereas the latter was physiologically dominant, the offspring reacting to the tobacco mosaic virus by local infections. In the reciprocal cross the response of the progeny is similar to that of Samson, i.e., the virus becomes systemic.

The following conclusions are provisionally drawn from these observations. In vegetative combinations of two variously reacting types one partner may exert an influence on the other, the most plausible explanation of which lies in the removal by the Samson stock of the 'barrier' permitting local infection only in *N. glutinosa*. The fact that such an influence is operative only during the continuation of the partnership also points to the fact that the nature of the reaction in a given host is conditioned by the substratum.

Burkholder (W. H.) & Li (C. C.). **Variations in Phytomonas vesicatoria.**—*Phytopathology*, xxxi, 8, pp. 753–755, 1941.

Inoculation experiments were carried out at Cornell University, New York, during the winter of 1939–40 with ten isolates (seven from pepper [chilli] and three from tomato) of *Phytomonas* [*Xanthomonas*] *vesicatoria* on different varieties of both hosts (mostly the foliage) with the following results. A Vermont chilli strain of the pathogen produced no infection on tomato, a very few small lesions were caused by three from the same host from Long Island, while three chilli isolates from Florida and three from tomato (Vermont, New York, and a culture from Mary K. Bryan) caused considerable infection. Two strains of *X. vesicatoria* from tomato were also pathogenic to tetraploid plants of the same host. The chilli isolates from Long Island produced abundant infection on the Bullnose, Chinese Giant, World Beater, California Wonder, and Ruby King chilli varieties, whereas the reaction of Oshkosh and Harris's Early Giant was very slight. The Vermont chilli strain and the three from tomato induced slow infection of all the chilli varieties. From these data the Vermont and Long Island chilli isolates are adjudged to be mutually related and distinct from the tomato strains, while the chilli isolates originating in Florida occupy an intermediate position. The only cultural difference between the various strains of possible utility as a physiologic criterion is the capacity to hydrolyse starch, which was confined to the tomato isolates, including two received from Indiana later than those mentioned above, one being identified as *P. vesicatoria* var. *raphani* (White) Burk. It is evident from these data that definite races of the parasite do exist, but the differences are insufficient for the establishment of varietal names. The number of races is unknown, but selection and breeding work will have to take into account their existence.

Lavallée (E.). **Quatre maladies des Tomates d'introduction récente dans la région de Montréal.** [Four Tomato diseases of recent introduction in the region of Montreal.]—*Ann. Ass. canad.-franç. Sci.*, vii, pp. 136–137, 1941.

Four tomato diseases recently introduced into Quebec are bacterial

spot (*Bacterium vesicatorium*) [*Xanthomonas vesicatoria*], causing an estimated loss of 50 per cent. at Saint-Césaire in 1938; bacterial canker (*Aplanobacter michiganense*); nailhead spot (*Macrosporium* [*Alternaria*] *tomato*) in two plantations at Île Bizard, where 80 to 90 per cent. of the fruits were unfit for sale; and buckeye rot (*Phytophthora terrestris*) [*P. parasitica*: *R.A.M.*, xx, p. 501], causing 5 per cent. damage at Berthierville.

Worley (C. L.), Lesselbaum (H. R.), & Matthews (T. M.). **Deficiency symptoms for the major elements in seedlings of three broad-leaved trees.**—*J. Tenn. Acad. Sci.*, xvi, 2, pp. 239–247, 1941.

Experiments are described in which *Catalpa speciosa*, *Ailanthus altissima*, and elm (*Ulmus pumila*) seedlings were grown in sand cultures from which calcium, potassium, magnesium, sulphur, potash, nitrogen, and iron were severally withheld. The characteristic deficiency symptoms which developed are described in detail for each element under the different species.

Pirone (P. P.). **Maintenance of shade and ornamental trees.**—xvii + 422 pp., 175 figs., New York, Oxford University Press, 1941. $4.50.

The first part of this well-illustrated, useful work deals with general practices in the maintenance of shade and ornamental trees. Part two (pp. 129–384) treats of specific abnormalities and comprises chapters dealing with the diagnosis of tree troubles, non-parasitic injuries, spraying equipment and methods, and disease control in general. These are followed by sections on the symptoms, causes, and control of the fungal, bacterial, insect, and virus diseases of all the important trees and shrubs grown in the eastern and mid-western parts of the United States. A selected bibliography is appended to each chapter.

Waterman (Alma M.). **Diseases of shade and ornamental trees: annotated list of specimens received in 1940 at the New Haven office, Division of Plant Pathology.**—*Plant Dis. Reptr*, xxv, 7, pp. 181–186, 1941. [Mimeographed.]

This annotated list of fungi inducing diseases of shade and ornamental trees received at New Haven in 1940 includes *Macrophoma* sp., causing leaf blight of *Cupressus arizonica* in Alabama and Texas, and *Hendersonia magnoliae* producing leaf spot of *Magnolia grandiflora* in Virginia, the latter being, apparently, a new record for the United States. The evidence obtained in relation to the former disease shows that there is an injurious leaf blight of species of *Cupressus* in the southern States, with which a *Macrophoma*-like fungus is associated. Further investigation is required, however, before it can be determined whether this organism is identical with *M. cupressi* (Cke & Hark.) Berl. & Vogl., or whether it is a new, unnamed species.

Tilford (P. E.). **Your shade trees. Tree wounds and their treatment.**—*Amer. Forests*, xlvi, 7, pp. 326–327, 2 figs., 1940.

In recent experiments to determine the most satisfactory type of wound dressing for common shade and forest trees, asphaltum prepara-

tions, which are free from injurious substances, consistently expedited healing, which was uniformly retarded, on the other hand, by Bordeaux paint.

POMERLEAU (R.). **Notes sur les maladies de l'Érable à Sucre.** [Notes on Sugar Maple diseases.]—*Ann. Ass. canad.-franç. Sci.*, vii, pp. 103–104, 1941.

Several new diseases of sugar maples [*Acer saccharinum*] have been studied in Quebec, including a trunk canker caused by *Eutypella parasitica* [*R.A.M.*, xix, p. 243], pure cultures of which were readily obtained and used in inoculation experiments.

GROVES (J. W.). **Pezicula carnea and Pezicula subcarnea.**—*Mycologia*, xxxiii, 5, pp. 510–522, 3 figs., 1941.

Detailed descriptions, and cultural and taxonomic notes are given on two species of *Pezicula* from Canada [*R.A.M.*, xviii, p. 761]: *P. carnea* on *Acer* spp., most commonly *A. rubrum*, and a new species, *P. subcarnea*, collected only on *A. pennsylvanicum*. Both species have a typical *Cryptosporiopsis* conidial stage.

WOLF (F. A.) & DAVIDSON (R. W.). **Life cycle of Piggotia fraxini, causing leaf disease of Ash.**—*Mycologia*, xxxiii, 5, pp. 526–539, 2 figs., 1941.

A study on the developmental cycle of the fungus *Piggotia fraxini* attacking various species of ash (particularly young trees in forest nurseries) throughout the United States [*R.A.M.*, xix, p. 328], showed the species to be polymorphic, with a conidial stage *Marssonia fraxini*, a spermogonial and carpogonial stage *Piggotia fraxini*, and a perithecial stage identified with *Mycosphaerella effigurata* (of which a list of synonyms and an amended description are given). The genetic connexion of these stages was demonstrated in cultural studies. All attempts at artificial infection in the laboratory and greenhouse were unsuccessful, but when old leaves bearing perithecia were attached to twigs of healthy trees in the forest, the conidial stage appeared on the young foliage after three weeks or more, and infection also resulted when leaves bearing conidia were attached to healthy twigs. In nature the fungus is commonly associated with other species such as *M. fraxinicola*, *Sphaerella fraxinea*, *Cylindrosporium fraxini* and *C. viridis*, and *Gloeosporium punctiforme*.

SMUCKER (S. J.). **Comparison of susceptibility of the American Elm and several exotic Elms to Ceratostomella ulmi.**—*Phytopathology*, xxxi, 8, pp. 758–759, 1941.

Inoculation tests in New Jersey in 1940 with spore suspensions of *Ceratostomella ulmi* through chisel wounds on several species of elms [*R.A.M.*, xviii, p. 558 *et passim*] resulted in 100 per cent. infection on *Ulmus americana*, *U. laevis*, *U. foliacea*, *U. procera*, *U. japonica*, and 'Mormon elm' (probably a small-leaved European variety), the corresponding figures for *U. pumila*, its vars. *pinnato-ramosa* and *arborea*, and *U. foliacea* var. Christine Buisman being 42, 70, 30, and 86 per cent., respectively. The mean percentages of die-back in the main

leaders ranged from 0 in the Christine Buisman variety to 90·9 in *U. americana*. Generally speaking, xylem discoloration was most pronounced and extensive in the more susceptible species.

Large (J. R.) & Cole (J. R.). **Control of nursery blight of Pecan seedlings by spraying with low-lime Bordeaux mixture.**—Abs. in *Phytopathology*, xxxi, 8, p. 768, 1941.

Under the excessively humid conditions prevailing in the south-eastern United States, budded pecan trees are liable to severe damage from nursery blight, caused by the *Sphaceloma* stage of *Elsinoe randii* [*R.A.M.*, xvii, p. 421], which invades leaflets of all ages, producing reddish lesions, averaging $\frac{1}{8}$ in. in diameter, on both surfaces, later turning ashen-grey on the upper sides and sometimes coalescing along the veins. Control of the disease was achieved in 1939 and 1940 by four applications of Bordeaux mixture, the first (at a strength of 4–1–100) being made between 5th and 15th April and the three following (6–2–100) at monthly intervals, the last about 10th July, the sprayed trees yielding nearly four times as many successfully budded trees as the unsprayed.

Ou (S. H.). **A study of the Cercospora leaf-spot of Tung Oil tree.** *Sinensia*, xi, 3–4, pp. 175–188, 9 figs., 1940. [Chinese summary.]

The agent of the leaf spot of tung oil trees, originally observed on *Aleurites cordata* in Hunan and described as *Cercospora aleuritidis* Miyake (*Bot. Mag., Tokyo*, xxvi, p. 66, 1912), has been found to be prevalent throughout Szechwan on the widely cultivated *A. fordii*, and is herein referred to *Mycosphaerella aleuritidis* (Miyake) Ou n.comb. [*M. aleuritidis* Ou n.sp.], another synonym being *Cercosporina aleuritidis* Sacc., Syll. Fung., xxv, p. 902, 1931.

The imperfect stage of the fungus, characterized by five to plurifasciculate, usually simple, somewhat denticulate, pale olivaceous, 1- to 5-septate conidiophores, 22 to 65 by 4·5 to 5 μ, and acicular-obclavate, straight or slightly curved, hyaline, ultimately olivaceous, 2- to 12-septate conidia, 35 to 135 (mostly 50 to 80) by 3 to 4·5 μ, is produced on the subcircular to irregular, rarely coalescent lesions, reddish- to dark brown on the upper and yellowish-brown on the under side, 4 to 16 mm. across, and the perithecia and spermogonia on the fallen diseased foliage, maturing in the spring. The gregarious, mostly hypophyllous, innate, globose, black, papillate perithecia measure 60 to 100 μ in diameter; the fasciculate, cylindrical to clavate, aparaphysate asci, 35 to 45 by 6 to 7 μ, contain eight hyaline, ellipsoid, biseriate, bicellular ascospores, 9 to 15 by 2·5 to 3·2 μ. The subglobose to ovoid spermogonia measure 50 to 70 by 45 to 60 μ, and the hyaline, rod-shaped spermatia 3·5 to 4·5 by 0·5 μ.

In pure culture different media and temperatures within a range of 12° to 30° C. exerted little influence on the growth of *M. aleuritidis*. Conidia developed from ascospores on sterilized *A. fordii* leaves only. The leaf spot was successfully induced on *A. fordii* by means of inoculation with conidial or ascospore suspensions.

The severity of the disease may be mitigated by the destruction of

fallen infected leaves during the winter, thereby eliminating the source of inoculum for the coming season.

Benton (V. L.) & Ehrlich (J.). **Variation in culture of several isolates of Armillaria mellea from Western White Pine.**—*Phytopathology*, xxxi, 9, pp. 803–811, 1 fig., 1 diag., 3 graphs, 1941.

At the Moscow School of Forestry, Idaho, the authors studied a number of western white pine (*Pinus monticola*) isolates of *Armillaria mellea* from the Cœur d'Alene National Forest [*R.A.M.*, xix, p. 126] with a view to determining the extent of physiological variation in malt agar cultures. The results of five experiments demonstrated wide variations between the several strains in cultural appearance, rhizomorph production, diameter of mycelial growth, degree of saprogenicity, and response to differences in wood moisture content, temperature, and hydrogen-ion concentration. The following optimal values were established: about 150 per cent. or slightly higher initial wood moisture content (initial oven-dry basis), 21° to 25° C. for growth on malt agar at P_H 5, and P_H 4·5 and 5·5 for development on the same medium at 25°. In one experiment involving 27 isolates, some were characterized by a cottony, white, profuse mycelium with a considerable number of long rhizomorphs; others produced a very sparse mycelium without rhizomorphs, while another series formed a reddish-brown sclerotial mat from the lower side of which a fair number of short rhizomorphs projected into the agar, longer ones also ramifying through the medium. The extent of mycelial growth made by the different strains over a 30-day period ranged from 38·5 to 54 mm.

Lohwag (K.). **Untersuchungen über die Holzzerstörung durch Fomes hartigii (Allesch.) Sacc. et Trav. und Fomes robustus Karst.** [Studies on wood destruction by *Fomes hartigii* (Allesch.) Sacc. & Trav. and *Fomes robustus* Karst.]—*Z. PflKrankh.*, l, pp. 481–494, 1940. [Abs. in *Zbl. Bakt.*, Abt. 2, ciii, 21–24, p. 407, 1941.]

Fomes hartigii, one of the commonest parasites of the silver fir [*Abies alba* (in Austria): *R.A.M.*, xvii, p. 358], invades the wood through the medullary rays, whence it passes into the tracheids, the upper and lower parts of which are both rapidly permeated by the hyphae. The penetration of the cell walls is accompanied by dissolution of the lignin, demonstrable by the phloroglucin-hydrochloric acid reaction. Besides lignin the fungus disintegrates cellulose and pectins, utilizing its enzymes for this purpose so that direct contact between the hyphae and the cell walls is not necessary. The so-called 'lines of demarcation', consisting of brown hyphal agglomerations, are visible in the infected wood.

The initial development of *F. robustus* [loc. cit.] in oak wood takes place in the vessels, in which, in fact, most of the hyphae are found even at an advanced stage of infection. The walls of the vessels withstand the attack of the pathogen, to which, however, the surrounding parenchyma cells and wood fibres succumb completely.

Sidki (I.). **Notes on the death of Stone Pine at Salamis.**—*J. Cyprus For. Ass.*, ii, 4, pp. 25–28, 1940.

Analyses of soil samples in the Salamis district of Cyprus, where

stone pines (*Pinus pinea*) suddenly began to die back in 1937, revealed a progressive increase in calcium carbonate in the deeper layers (e.g., from 39·3 per cent. at 6 in. to 62·5 per cent. at 3 ft.), leading to the formation of a calcareous hard pan through which the tap roots are unable to penetrate, other contributory factors to the pathological condition of the trees being lack of moisture and insufficient nutrition.

Gosselin (R.). **Notes sur le Polyporus circinatus Fr.** [Notes on *Polyporus circinatus* Fr.]—*Ann. Ass. canad.-franç. Sci.*, vii, p. 104, 1941.

Polyporus circinatus, the agent of a white pocket rot of the base of conifers, is widespread in Quebec on spruces [*R.A.M.*, xix, p. 445], especially *Picea rubens*, entering its host through the tap roots. Special environmental conditions, the exact nature of which has not yet been determined, are necessary for the development of the fungus.

Pomerleau (R.) & Morais (L.). **Les caries de l'Épinette noire à Duchesnay.** [Black Spruce rots at Duchesnay.]—*Ann. Ass. canad.-franç. Sci.*, vii, p. 103, 1941.

Of 277 black spruce [*Picea nigra*] trees examined at Duchesnay (Quebec) in 1939, 46 were infected by one or more forms of decay, of which *Fomes pini* was responsible for 69·5 per cent. involving 86·2 per cent. of the total volume, the corresponding figures for *Stereum sanguinolentum* and *Poria subacida* being 17·3 (5) and 13 (2·8) per cent., respectively, while other [unspecified] defects covered 4·6 per cent. of the volume. *F. pinicola* and *Armillaria mellea* caused secondary rots of wounded and dead areas.

Buchanan (T. S.) & Englerth (G. H.). **Decay and other volume losses in wind-thrown timber on the Olympic Peninsula, Wash.**—*Tech. Bull. U.S. Dep. Agric.* 733, 30 pp., 10 graphs, 1940.

General observational data were made annually from 1921 to 1924 and intensive detailed examinations were carried out in 1926, 1929, and 1936 on the condition of Douglas fir (*Pseudotsuga taxifolia*), Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), silver fir (*Abies amabilis*), and western red cedar (*Thuja plicata*) blown down in January, 1921, on the Olympic Peninsula, Washington. The sources of loss were four, viz., breakage, high stumps, insect damage, and decay [unspecified]. No loss from decay was noted for at least two years after the storm, but once decay had become evident, loss from it soon exceeded that from any other source in all species except western red cedar.

The first zone invaded was the sapwood, with the adjacent heartwood. Western hemlock and silver fir, the two species with the highest percentage of sapwood and the least durable heartwood, decayed most rapidly. Sitka spruce showed much faster decay than Douglas fir or cedar. The sapwood of Douglas fir decayed somewhat rapidly, but the heartwood gave evidence of marked durability. Western red cedar suffered least.

The evidence indicates that if wind-thrown trees in the spruce-hemlock and Douglas fir old-growth types of the Washington and

Oregon coast are to be salvaged free from decay, requisite steps must be taken within one or two years of their being blown down. Douglas fir trees contain considerable saleable volume even 15 years after they have been blown down, but most of this sound volume occurs in trees over 30 in. in diameter. In Sitka spruce practically all sound wood, irrespective of tree size, is destroyed within 15 years. Western hemlock and silver fir, irrespective of size, are rendered worthless within eight years of being blown down. Even when the trees have been lying on the ground for 15 years, the loss from decay in western red cedar does not exceed the original sapwood volume.

RENNERFELT (E.). **Das Wachstum einiger Pilze aus Holzschliff bei verschiedener Temperatur.** [The growth of some fungi from mechanical wood pulp at varying temperatures.]—*Arch. Mikrobiol.*, xii, 1, pp. 19–40, 4 graphs, 1941.

A tabulated survey is given of the writer's experiments at the Gothenburg (Sweden) Botanical Institute on the growth at different temperatures between 5° and 42° C. of 14 fungi isolated from freshly ground wood pulp [*R.A.M.*, xix, p. 633] on a synthetic medium with the addition of saccharose and yeast extract.

The Torulopsidaceae, comprising *Rhodotorula glutinis*, *R. gracilis* [ibid., xvi, p. 575], *Torulopsis candida* [ibid., xviii, p. 198], and *T. molischiana* (Zikes) Lodder, grew best at 22°, 27°, 22°, and 22°, respectively, the blue-staining fungi, *Phialophora fastigiata*, *Phoma lignicola* [ibid., xvi, p. 574], *Pullularia pullulans*, and *Trichosporium heteromorphum* [ibid., xvi, p. 575] at 22°, 22°, 27°, and 32°, respectively, the moulds *Aspergillus fumigatus* and *Penicillium rugulosum* at 37° and 32°, respectively, the Hyphomycete *Geotrichum candidum* at 22°, and the wood-rotting organisms, *Pholiota mutabilis* [ibid., xv, p. 72], *Polyporus* [*Polystictus*] *hirsutus*, and *P. versicolor* at 22°, 32°, and 27°, respectively. At 5° few of the fungi made measurable growth, *G. candidum* being the most active at this temperature; at 12°, however, there was appreciable development in the majority of the cultures, though *A. fumigatus* and *P. hirsutus* remained practically stationary. The maximum for the blueing fungi lay between 32° and 37°, except in the case of *T. heteromorphum*, which developed between 37° and 42°. The maximum for the moulds, *Torulopsis molischiana*, and *P. hirsutus* was not attained at 42°, whereas *P. versicolor* and *Pholiota mutabilis* succumbed at 37° and 27°, respectively. *R. glutinis* ceased to develop at 32° and *R. gracilis* between 37° and 42°. In the Torulopsidaceae the largest number of cells coincided with the optimum temperature for mycelial development, while the blueing fungi produced conidia in the greatest abundance at a temperature below the optimum for vegetative growth. At low temperatures cell division was generally slow but the cells persisted for lengthy periods in a viable condition, whereas at a higher range the reverse position tended to obtain, though with considerable differences among the individual organisms.

Discussing the bearing of these experimental data on the practical working of paper mills, the writer points out that the temperature of the backwater is a decisive factor in the development of micro-organisms in the fibre suspension, the maximum of 1,000 to 2,000 spores

per c.c. being reached in his experiments at 30° to 35° [ibid., xvi, p. 574].

Örnhjelm (R.). **Framställning av inhemskt blånadsskyddsmedel.** [Production of a home-produced preservative against blueing.]—*Papp. Trävarutidskr. Finl.*, xxii, 23, pp. 459–464, 10 figs., 2 graphs, 1940.

A Finnish pentachlorophenol preservative against the blueing of timber associated with species of *Mucor*, *Lenzites*, and *Hormonema* [*R.A.M.*, xiv, p. 270; xix, p. 57], sold under the trade name of Ky 5, is claimed to be equally effective with the American preparations, dowicide and santobrite, without their drawback of inducing dermatitis. The dosis toxica of Ky 5 for the three above-mentioned organisms, in the order named, in malt agar cultures was below 0·0025, 0·055, and below 0·0025 per cent., respectively, exactly the same values being obtained with dowicide. Like the imported preparations, Ky 5 is a strong poison and must be applied with the customary precautions.

Edgecombe (A. E.). **The growth rate of several wood-inhabiting fungi.**—*Phytopathology*, xxxi, 9, pp. 825–831, 1 fig., 1941.

At the Northwestern University, Evanston, Illinois, cultures of six lignicolous fungi, viz., *Collybia velutipes*, *Pleurotus ostreatus*, *Merulius lacrymans*, *P. ulmarius*, *Pholiota adiposa*, and *Armillaria mellea*, were grown in shaded light on 1 per cent. nutrient agar enriched with prune juice (from ½ lb. steamed fruit per l. agar) and adjusted to a hydrogen-ion concentration of P_H 6, the temperature of the incubator being maintained at 25° C. Two series of tests were run, the first extending from 31st March to 2nd May and the second from 19th April to 21st May. Notwithstanding the uniformity of these highly favourable conditions, the fungi developed at different rates, their average daily growth in diameter of the colony in the order given above being 0·76, 0·77, 0·54, 0·46, 0·30, and 0·12 cm., respectively, in the first series of experiments, and 0·83, 0·82, 0·56, 0·51, 0·32, and 0·13 cm., respectively, in the second. The average daily growth increment for both *C. velutipes* and *Pleurotus ostreatus*, computed from these data, is 8 mm., the corresponding figures for *M. lacrymans*, *P. ulmarius*, *Pholiota adiposa*, and *A. mellea* being 5·5, 4·8, 3, and 1·2 mm., respectively.

Ogilvie (L.). **Diseases of vegetables.**—*Bull. Minist. Agric., Lond.*, 123, iv+84 pp., 12 figs., 1941. 1*s.* 6*d.*

This bulletin, stated in the foreword to be essentially a revision and expansion of No. 68 in the same series (second edition, 1935), has been rewritten mainly for growers, with emphasis on the description of symptoms, the influence of cultural practices on the incidence of disease in vegetable crops in England and Wales, and control measures.

Walker (J. C.). **Disease resistance in the vegetable crops.**—*Bot. Rev.*, vii, 9, pp. 458–506, 1941.

The author succinctly reviews the history of investigations made since the middle of the last century into the nature of plant resistance

to fungal diseases, with special reference to the breeding of resistant varieties, and then deals in turn with such points as the nature of resistance, escape, exclusion of the pathogen by the host, resistance resulting from host-parasite interaction, variability of the pathogen, and the relation of environment to resistance, after which he discusses in detail resistance by specific vegetable crops to some of the chief fungal diseases affecting them. The paper concludes with a bibliography of 255 titles.

Lachance (R. O.). **Effets du calcium sur l'anatomie des feuilles de Choux de Siam malades par carence de bore.** [The effects of calcium on the anatomy of Siamese Cabbage [Turnip] leaves suffering from boron deficiency.]—*Ann. Ass. canad.-franç. Sci.*, vii, pp. 107–108, 1941.

The cambium and phloem of turnip leaves deprived of boron are replaced by an undifferentiated parenchyma. The addition of boron to the nutrient solution stimulates the differentiation of the parenchyma into wood vessels, and the same effect follows the immersion of boron-deficient leaves in boron or calcium chloride solutions, the latter inducing more rapid and extensive differential activity than the former. A close relationship between calcium and boron in plant metabolism is hereby indicated.

Coons (G. H.), Kotila (J. E.), & Bochstahler (H. W.). **Black root investigations in Michigan and Ohio.**—*Proc. Amer. Soc. Sug. Beet Technol., East. U.S. & Can., 1941.* [Abs. in *Sugar*, xxxvi, 9, pp. 41–42, 1941.]

Drainage is well known to be beneficial in the reduction of sugar beet damping-off or black root (*Pythium* spp., *Rhizoctonia* spp., and *Aphanomyces* spp.), and good results have been obtained by arranging the plants on ridges with furrows at either side of two rows, or by the provision of furrows for each eight rows. Recent studies have shown *A.* spp. to be of great importance, not only as an agent of damping-off, but also as a cause of persistent rotting of the basal portion of the taproot. Very promising results in the control of these organisms have been secured by the incorporation with the seed of liberal amounts of a phosphate fertilizer—three or four times the customary dose of 100 or 150 lb. per acre.

Smith (P. G.) & Walker (J. C.). **Certain environal and nutritional factors affecting Aphanomyces root rot of garden Pea.**—*J. agric. Res.*, lxiii, 1, pp. 1–20, 2 figs., 4 graphs, 1941.

In a study in Wisconsin of the root rot of garden pea caused by *Aphanomyces euteiches* [*R.A.M.*, xx, pp. 211, 245], the most rapid radial expansion of the fungus on potato dextrose agar was found to occur at 28° C., no growth being made either at 8° or 36°. In plants grown in sand the optimum temperatures for disease development were 24° and 28°; at 12° no infection was observed during a period of 11 days, whereas at the optimum temperatures nearly all plants were severely affected during that period. The optimum radial expansion of the fungus on phosphate-buffered potato dextrose agar occurred between

P_H 4·5 and 6·5, the limits for growth being about P_H 3·4 and slightly above P_H 8·0. An apparent isoelectric point appeared at P_H 5·9. In naturally infested soil practically no infection occurred when the moisture was maintained at 45 per cent. of the water-holding capacity, while at 75 per cent. infection was quite severe. In artificially infected sand cultures kept under conditions of controlled nutrition the severity of disease decreased in direct proportion to the increase in total salt concentration of the nutrient solution, being nil at the highest concentrations used and most severe at the lowest. Using dilute or concentrated solutions, having nitrogen, phosphorus, and potassium either in excess of the balanced solution or lacking each of them, had no effect on disease development. Under favourable conditions for infection in sand cultures all plants may become infected within five days. After infection had occurred, high nutrient concentrations did not appear to inhibit the development of the disease. On agar made from nutrient solutions used in the sand culture the fungus grew readily on the high concentrations that had been found to inhibit its growth in sand cultures. It is suggested that the absence of infection in the presence of high salt concentrations in sand cultures is due to some other cause than the salt concentration. It is thought possible that pea plants acquire a morphological resistance as a direct result of the high concentration of the nutrient.

McWhorter (F. P.). **Isometric crystals produced by Pisum virus 2 and Phaseolus virus 2.**—*Phytopathology*, xxxi, 8, pp. 760–761, 1 fig., 1941.

Using the trypan blue technique for virus identification (*Phytopathology*, xxx, p. 788, 1940), the writer demonstrated the presence in the cytoplasm and nuclei of horse bean (*Vicia faba*) cells infected by *Pisum* virus 2 and *Phaseolus* virus 2 [*R.A.M.*, xvi, p. 723], of isometric, deeply staining crystals, 0·3 to 4 μ in diameter. The nucleoli of diseased cells assume more or less cubical shapes in response to the development within them of one to five or more crystals. The occurrence of inclusion bodies within the nuclei, common in virus-infected animal cells, has been established only in one other instance in plants, viz., tobacco attacked by *Nicotiana* virus 7 [severe etch: ibid., xx, p. 602], and a basic relationship between the last-named and the legume viruses under discussion (long known to be closely allied in physiological properties and host range) is suggested by the isometric character of the crystalline inclusions in all three cases. The bean inclusions, though comparable in some degree to the hexagonal crystals of tobacco mosaic, are much more stable, being capable of being dissected out and persisting in paraffin sections fixed in aceto-formalin and in whole mounts processed by the dioxan technique (*Stain Tech.*, xi, pp. 107–117, 1936). They were found in every case investigated in which foliar mottling had been induced by the systemic invasion of either of the viruses, as well as in certain artificially inoculated legumes, but were absent from healthy leaves, so that their production is apparently a function of the virus rather than of the host. The crystals frequently occupied the stomatal guard cells.

Bean diseases common in Wyong district.—*Banana Bull., Sydney*, i, 60, p. 9, 1941.

According to Dr. Parbery, Soil Chemist, the widespread failure of dwarf French bean [*Phaseolus vulgaris* var. *nana*] crops raised from home-grown seed on the farms of the Wyong district of New South Wales is attributable to an excessive uptake of manganese (over 600 p.p.m.) from the dark grey, fine sandy, very acid loam soils. Symptoms of the disease, known locally as 'scald', include browning of the leaves, stunting, defoliation, and failure to set pods. Comparable seed samples grown by Dr. Parbery on a yellow sandy loam enriched with organic matter, dolomite, and complete fertilizers produced vigorous plants containing only 30 to 50 p.p.m. manganese. The examination of scalded crops in May, 1940, further revealed symptoms of magnesium deficiency in the form of a whitish-yellow discoloration of the leaves; the manganese content of such plants was inordinately high, reaching in extreme cases nearly 1,800 p.p.m., while phosphate and nitrogen were also present in excess.

The abnormally high uptake of manganese, iron, and possibly aluminium by 'scalded' bean plants, as well as the chlorosis associated with magnesium deficiency, are interpreted as different expressions of mineral depletions of soils, giving rise to excessive acidity, which it is believed may be remedied by the application of dolomite at a minimum rate of two tons per acre, the first dose being allowed to react with the soil for two months prior to planting.

Ware (W. M.) & Glasscock (H. H.). **Chocolate spot of Beans in 1941.** —*J. Minist. Agric.*, xlviii, 2, pp. 91–94, 1941.

In 1941 extensive damage to field beans by chocolate spot (*Botrytis cinerea*) [*R.A.M.*, xx, pp. 441, 442] was reported throughout the south of England. The authors obtained the opinions of a number of farmers on the conditions existing in about 100 infected fields. The evidence showed that intensity of attack ranged from slight spotting on a few leaves to the killing of all leaves and blossoms and stem-blackening. In about one-fifth of the cases the crop was beyond saving, and was ploughed in or cut for silage or hay; but at the time the decision was made only the lower leaves and blossoms of some of the plants were dead. Most of the undisturbed crops recovered when sunny weather returned, and yielded about one-half to two-thirds of the original estimate.

In some instances the first outbreaks occurred in early March; but the main attack began when, after a long period of drought, drizzle, mist, or light rain were of daily occurrence from 23rd May until 13th June. Early infections produced severe injury, but even when symptoms did not appear until June, much damage was sometimes caused.

There was no indication that the previous kind of crop planted influenced severity. Beans sown in September and October showed all degrees of attack, but of nine crops sown in November or December only one was severely affected. No infection was observed on spring-sown beans. Rate of seeding appeared to have no effect, and frost damage is not regarded as a main factor. There was some indication that potash or phosphate deficiency and bad drainage favoured attack,

but many growers commented on the excellent health of the plants before they were attacked. There is no doubt, however, that the outbreaks were favoured by wet weather early in the growing season.

YARWOOD (E. C.). **Sporulation injury associated with downy mildew infections.**—*Phytopathology*, xxxi, 8, pp. 741–748, 1941.

A tabulated account is given of the writer's quantitative studies at the University of California, Berkeley, on the injury inflicted on onion, hop, and spinach leaves by the sporulation of the downy mildews, *Peronospora destructor* [*P. schleideniana*], *Pseudoperonospora humuli*, and *Peronospora effusa*, respectively [*R.A.M.*, xix, p. 161].

The green weight reduction due to this source was shown by comparative measurements under controlled conditions to average 55 per cent. of the green weight of healthy leaves in three tests with onion, 17 per cent. in two with hops, and 48 per cent. in one trial with spinach. In field plots of infected Yellow Bermuda onions yield increases from the use of 2 per cent. rosin-lime-sulphur and 0·2 per cent. malachite green+SS3 (0·2 per cent. Grasselli spreader), both tending to inhibit the sporulation of *P. schleideniana*, exceeded those obtained with 0·25 per cent. cuprocide+0·25 per cent. CSO (0·25 per cent. cotton-seed oil emulsified with egg), which exercises less effect on the reproduction of the pathogen. The following were the clean seed yields (in gm.) per plot secured with the different treatments: controls 2·67, rosin-lime-sulphur weekly and fortnightly 46·2 and 4·32, respectively, and malachite green weekly and fortnightly 38·9 and 9·29, respectively.

Attempts to determine whether sporulation exerted any influence on water loss in infected onion and hop leaves gave inconclusive results. The respiration of non-sporulating mildewed leaves was 56 per cent. higher than that of healthy foliage, and the respiration of sporulating leaves 10 per cent. less than that of non-sporulating mildewed material.

On heavily sporulating onion leaves some 10 per cent. of the stomata were occupied by sporangiophores, the surface area of which plus sporangia approximately equalled that of the foliar surface. The dry matter content of the sporangiophores plus sporangia produced during the night of sporulation amounted to 5 per cent. of the dry weight of infected leaves, and this transfer of nutrients from the host to its parasite is believed to be the feature of sporulation most likely to be responsible for the injury observed.

LACHANCE (R. O.), BERTRAND (P.), & PERRAULT (C.). **L'atrophie du cœur du Céleri : maladie par carence de bore.** [Heart atrophy of Celery, a disease caused by boron deficiency.]—*Ann. Ass. canad.-franç. Sci.*, vii, p. 133, 1941.

Celery plants in Quebec suffering from 'heart atrophy' a hitherto undescribed physiological disease, are characterized by stunting (height 4 to 7 in.) and rigidity and brittleness of the petioles, those of the heart leaves being furthermore bent over and interlaced, turning brown and gradually shrivelling; ultimately they disappear completely, leaving a gap surrounded by the outer petioles. The condition is quite distinct from black heart, being found only on dwarfed plants and

invariably accompanied by cracking of the petiole. Effective control was given by the application of borax at the rate of 15 lb. per acre [cf. *R.A.M.*, xviii, p. 817].

PRICE (W. C.). **Classification of Hawaiian Commelina-mosaic virus.**—*Phytopathology*, xxxi, 8, pp. 756–758, 1 fig., 1941.

In greenhouse tests at the Rockefeller Institute for Medical Research, Princeton, New Jersey, a yellow strain of the mosaic virus affecting *Commelina nudiflora* in Hawaii [*R.A.M.*, xvi, p. 763] was readily transmitted to dicotyledonous hosts by means of rubbing, but more difficulty was experienced with a green strain, which in a second trial, however, infected Turkish tobacco. The virus was fairly easily conveyed from tobacco to other plants, and both strains infected *Nicotiana glutinosa*, *N. alata*, *N. bigelowii* var. *quadrivalvis*, *N. glauca*, cucumber, and *Zinnia elegans*, the symptoms being generally similar to, but distinguishable from, those of ordinary cucumber mosaic in the same host, while differences were also apparent between the effects of the *Commelina* mosaic strains and those of the southern celery mosaic strain of cucumber mosaic [ibid., xv, p. 195]. The yellow strain of the *Commelina* mosaic virus consistently induced a more brilliant coloration of the infected leaves than the green one. In cross-protection tests in 1940 on the Golden Gem variety of *Z. elegans* on the lines of those already described [ibid., xiv, p. 812], the yellow strain caused a green mottling, while the green one induced only mild, transient symptoms. In healthy plants inoculation with the cucumber mosaic virus induced profuse infection, whereas those protected by previous inoculation with the *Commelina* virus failed to develop a single lesion. These results, together with others not reported here, are considered to establish a close relationship between the *Commelina* mosaic virus strains and other representatives of the cucumber mosaic virus group, and indicate that *Commelina* in Hawaii is affected by a number of different strains of cucumber mosaic virus.

JENKINS (W. A.). **Some leaf spots and berry rots of Muscadine Grapes in Georgia.**—Abs. in *Phytopathology*, xxxi, 8, pp. 767–768, 1941.

In addition to diseases already reported from another source [*R.A.M.*, xx, p. 623], muscadine grapes in Georgia suffer from a foliar disorder caused by *Cercospora brachypus* and characterized by expanding, angular, chlorotic areas, which become necrotic in the centre and are surrounded by a narrow halo. The organism has a *Mycosphaerella* stage to be described elsewhere as a new species.

Statutory rules and orders, 1941, No. 1726. Destructive Insect and Pest Acts, England. The Sale of Diseased Plants (Amendment) Order of 1941. Dated October 30, 1941.

The present further Amendment, effective as from 15th November, 1941, to the Sale of Diseased Plants Order of 1927 [*R.A.M.*, xv, p. 464] provides for the insertion in Part B of the First Schedule to the principal Order a clause prohibiting the sale, or exposure for sale, for planting of any (crucifer) plants substantially attacked by *Plasmodiophora brassicae*.